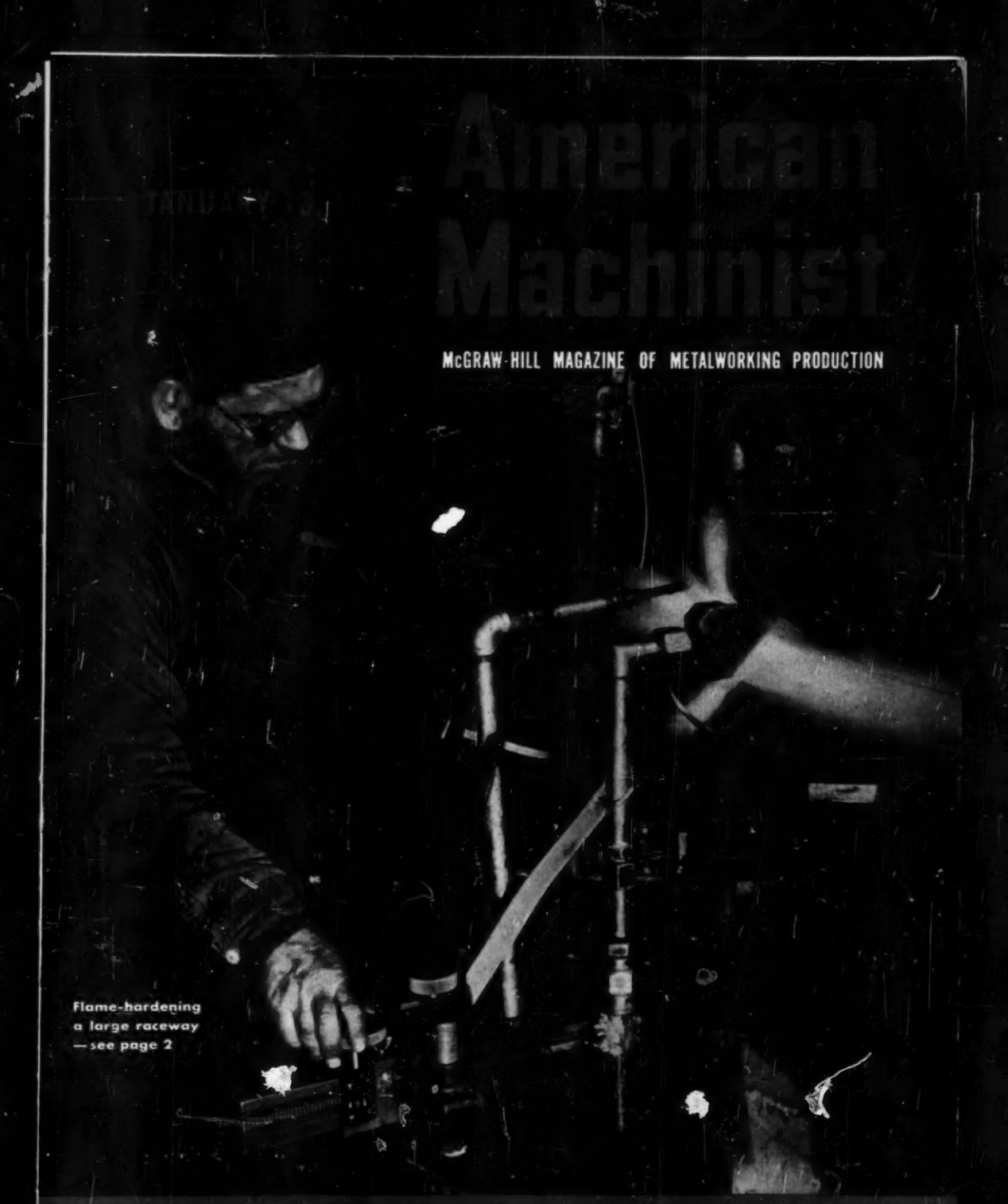
JANUARY 1951

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Flame-hardening a large raceway —see page 2

SURFACE FINISH AS A TOOL—a special report

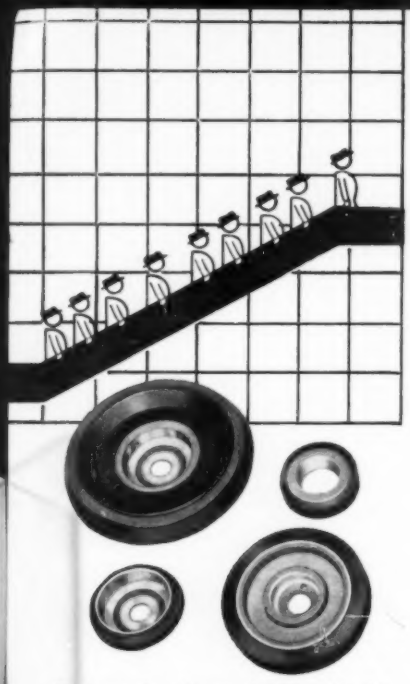
WHAT NOT TO DO IN RESISTANCE WELDING

THE PROBLEM OF TAPERED THREADS

PRODUCTION OF ESCALATOR PARTS

...UP 100%

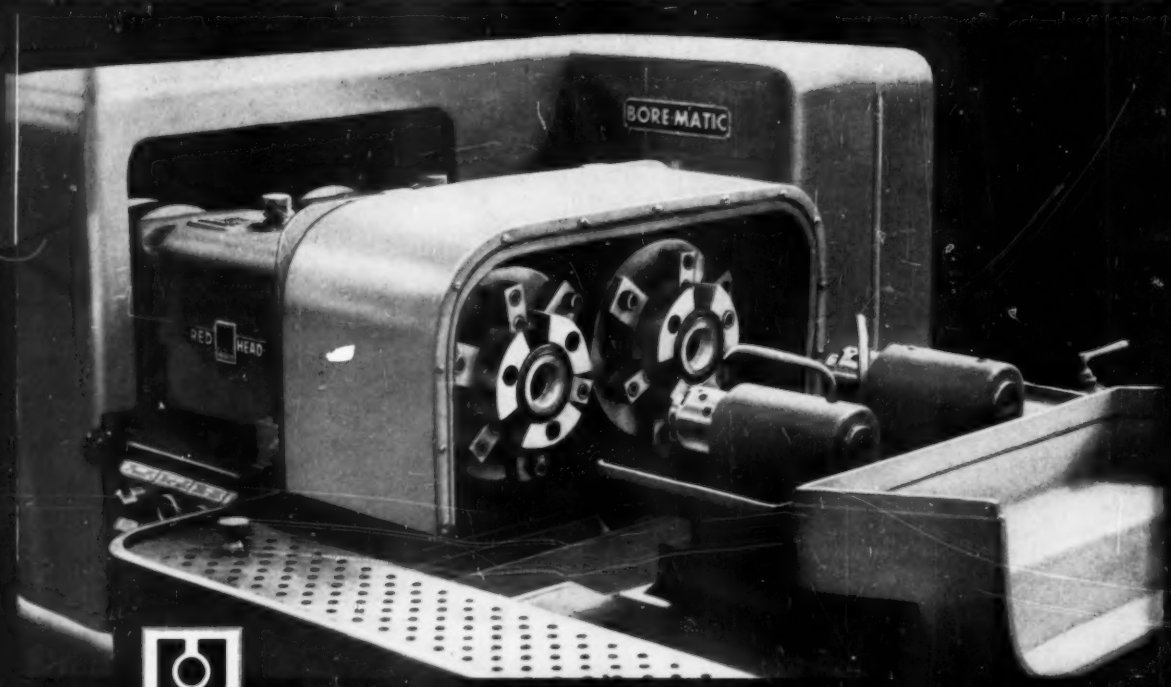
Another example of how the new Heald Machines are boosting production, improving precision, and cutting the manufacturing cost per unit



These are the wheels and roller guides that keep an escalator running smoothly. They are now precision finished twice as fast as before, on the Heald Model 221 Bore-Matic shown below.

The new Heald Model 221 Bore-Matic shown below is used by a manufacturer for finishing four different hard-rubber-rimmed escalator wheels and roller guides—two aluminum die castings and two of steel. This two-station, single-end machine bores, faces and chamfers to a .0005" tolerance on aluminum parts, .003" on steel, handling two parts simultaneously in a single, high-speed, automatic machine cycle. Not only has production been *doubled* over previous methods, but parts are more accurate on size tolerance, have a superior finish, and are produced with less operator effort.

Whatever your product, chances are there's a new Heald machine that can offer you similar savings in precision finishing. Your nearest Heald representative, or our engineers at Worcester, will be glad to study your problems and help you do a better job at lower cost.



HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

BURNHAM FINNEY .....Editor
E. J. TANGERMAN.....Managing Editor

•

Associate Editors: RUPERT LE GRAND, BEN C. BROSHEER (Chicago), ANDERSON ASHBURN, H. E. LINSLEY, CHESTER S. RICKER (Detroit), J. J. McGUINNESS (News), MILES J. ROWAN

•

Assistant Editors: CHARLES D. EMERSON, EILEEN ERSHLER

•

SYDNEY OXBERRY.....Art Director
RICHARD ROOMAN .....Assistant
ANNE PALMER .....Makeup

•

DEXTER KEEZER..Director, Economics Dept.

•

JOHN CHAPMAN....World News Director

•

GEORGE E. DOYING, JR.....Washington

•

FRED H. COLVIN.....Editor Emeritus

•

ALBERT HAUPTLI, JR. .....Publisher
WILLIAM E. KENNEDY.....Asst. Publisher

•

District Managers: JOHN H. KOCH, M. A. WILLIAMSON, JR., Statler Building, Boston, Mass.; JAMES A. McGRAW, HUGH BRITTON, 330 W. 42nd St., New York 18, N. Y.; DAVID G. JONES, Architects Bldg., 17th & Sansom Sts., Philadelphia 3, Pa.; RAY DEEN, ANSON E. MEANOR, 520 N. Michigan Ave., Chicago, Ill.; ADOLPH F. TISCHER, Hanna Bldg., Cleveland, O.; ROBERT H. ANDERSON, 1110 Delta Ave., Cincinnati, O.; PHILIP G. WEATHERBY, Penobscot Bldg., Detroit, Mich.; JOHN W. OTTERSON, 68 Post St., San Francisco, Calif., CARL E. YSINGER, 621 So. Hope St., Los Angeles, Calif.; R. C. MAULTSBY, Rhodes-Haverty Bldg., Atlanta, Ga. Other offices: Continental Bldg., St. Louis, Mo.; National Press Bldg., Washington, D. C.; Oliver Bldg., Pittsburgh, Pa.; Aldwych House, Aldwych, London, W.C. 2.

•

Member of ABP and ABC.

•

COPYRIGHT 1949 by McGraw-Hill Publishing Company, Inc. All rights reserved.

•

Published every other Thursday. Price 35c per copy. Allow ten days for change of address. Subscription Rates: United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada, $6 for one year, $10 for two years, $12 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U. S. A. Return postage guaranteed.

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index.

CONTENTS for JANUARY 13, 1949 ..... VOL. 93, NO. 1

Cover.....*Operation pictured is described on page 2*

ADMINISTRATION

Editorial .....*Burnham Finney* 83
What Are Your Chances With No Profits?.....*J. H. McGraw, Jr.* 116
Working the Willing Horse.....*Round Table* 117

SPECIAL REPORT

Practical Application of Surface Finish.....*Georg Schlesinger* 101

ENGINEERING

Why Taper Threads Don't Fit.....*W. E. Burndrett* 95
Low-Pressure Lubricating Devices.....*(RBS)* 139

FINISHING

Paint on Tap.....*Walter Schmid* 111

INSPECTION

Micrometer Height Gage Corrects Measuring Troubles..*R. Kaden* 122

ASSEMBLY AND HEAT-TREATING

What Not to Do When Resistance Welding..... *R. T. Gillette* 85
Which Atmosphere for Heat-Treating and Brazing....*C. E. Peck* 90
Salt Bath Puts Whip into Trout Rods and Antennas....*M. Karge* 124
Ring Knife Cuts Tying Twine on Motor Coils.....*L. F. Roth* 124

MATERIAL CUTTING, FORMING

Punch Press Broaches Spline.....*D. C. Haneline* 116
Steel Die-Castings Produced Successfully.....*Robert B. Stanton* 118
Bar Reduced Rapidly with Triple Bits....*D. Moore & C. Johnson* 122
Angle Iron Drilled on Tilted Universal Table.....*S. B. McKay* 124
Bending Tubing and Moldings.....*(RBS)* 137

MATERIALS HANDLING

Folding Tote Boxes Release Floor Area.....*Chester S. Ricker* 120
Comparative Rating of Fork Trucks.....*(RBS)* 135

TOOLING

Shop Shots 114
Short Cuts..... *A. H. Waychoff* 119
Split Holder Clamps Small Parts for Buffing.....*John K. Lukacs* 120
Die Ejects Slugs Without Bolster Hole.....*Roger Isetts* 120
Universal Diesels Save Costs.....*Gerhard Wenke* 121
Quick Assembly Chucks Gear.....*W. J. Blankenship* 121
Tailstock Centers Large Pipes.....*Thomas Gary* 121
Clamp Clamps Down—But Unclamps to the Side.....*H. Buckley* 122
Peening Method Increases Life of Shell Reamer.....*W. Brunner* 123
Multiple-Spindle Heads Finish Sewing Machine Parts..... 123
Metal-Cutting Bandsaws.....*(RBS)* 139

NEWS OF METALWORKING

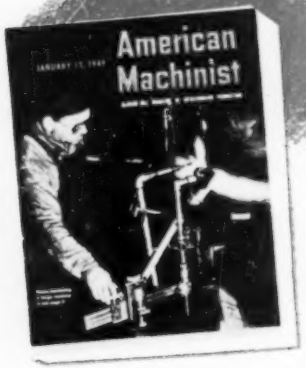
Spot News 79
Gaging Metalworking..... 80
Names in the News..... 131
British Car Output..... 126
Detroit News 130

DEPARTMENTS

Talking Shop..... 100
Reference Book Sheets.... 135
Shop Equipment News..... 141
New Books..... 184
Parts and Materials..... 154
Round Table Discussions.... 158
To the Editor..... 180

PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y. Cables: "McGRAW-HILL, NewYork"

James H. McGraw (1860-1948), Founder; James H. McGraw, Jr., President; Curtis W. McGraw, Vice-President and Treasurer; Eugene Duffield, Executive Assistant for Publications; Nelson Bond, Director of Advertising; Joseph A. Gerardi, Secretary; J. E. Blackburn, Jr., Director of Circulation



Chips and QUIPS

Our Cover . . . Large bearing raceways are shown being flame-hardened on raceway faces for greater wear resistance in our cover picture, taken at Messinger Bearings, Inc., Philadelphia. A specially designed tip spreads the flame to both sides of the V-shaped way while the ring rotates. It is followed immediately by water quench, so no distortion occurs. Kodachrome courtesy Air Reduction Sales Company.

Surface Finish . . . Information on surface finish has been hard to come by and mostly in the hands of a few experts. Our own Ben Brosheer put the available data together in our well-received two-part report (Sept. 9 & 23 *A.M.*), but we were not satisfied with that—we wanted the latest on the most up-to-date applications. A world authority is Dr. Georg Schlesinger, who has been conducting just such tests at his laboratory in Loughborough, England, these ten years past. Correspondence and cables bring you "Surface Finish as a Shop Tool" from his pen—the evaluation of theory in terms of shop application. Here is the essence of practicability on surface finish in ten pages.

Tapered Threads . . . W. E. Burndrett of Houston, Texas, has had to do with close-tolerance tapered threads for years. He knows intimately the difficulty in attempting to gage them and to achieve desired fits. He's put down his observations, opinions and suggestions to explain the problems involved. We present them here to encourage any one with a potential answer to tell about it.

Controlled Atmospheres . . . of Westinghouse Electric Corp. tells how controlled atmospheres are important in heat-treating processes like bright annealing, bright hardening, gas carburizing, furnace brazing and sintering of powdered metals. Mr. Peck discusses the applications of such atmospheres with respect to materials, too.

Steel Die Castings . . . Steel is now being successfully die-cast on the West Coast. The trick is carbide and high chrome linings for the injection equipment in order to provide the necessary heat resistance. What's more, the heating furnaces are on trunnions and pour directly into the hopper. Robert B. Stanton, consulting engineer on the job, tells you how it is done.

Paint on Tap . . . Stewart Warner, in its new setup for producing lubrication units and grease pumps, has included a continuous circulating system for painting in various colors. We include herewith a description of the system in the bright- and finish-coated departments and the arrangements for the different colors to different booths.

No Tick . . . Edward N. Cole, chief engineer of Cadillac Div., G. M., and Frank Skinner of MacManus, John & Adams, who handle the advertising, were discussing the quietness of modern auto engines. "So quiet you can hear the tick of the clock" has been the ad slogan . . . At which point Cole produced a letter from a lady customer in Grosse Pointe, Mich., who had seen the ad. She wrote: "I'd like to hear the 'tick' in my clock. Mine won't keep running!" . . . That's why G. M. divisions are shifting the clocks from glove-compartment doors to the instrument panel. The shocks from slamming that door are too much for the average auto clock.

Coming . . . Jan. 27 *A.M.* will be our 36th Annual Review Number, with pictures and descriptions of the new metal-working equipment, tools, parts and materials of 1948—a condensed catalog of some 1400 items. Included also will be a 16-page statistical report on Metal-working—a summary of 1948 and a look ahead into 1949 . . . This is the issue you'll want to keep under your hand as a convenient ordering reference during this year . . . Don't miss the rews and data sheets in it, as well.

RESISTANT WELDER . . . R. T. Gillette joined the General Electric Research Laboratory in 1902. During World War I he was in charge of manufacturing of X-ray contacts for automobile ignition systems. He was instrumental in the development of electric-furnace brazing at General Electric and won the coveted Charles A. Coffin Foundation Award for his work on welding dissimilar metals with Elkonite electrodes. Another successful job was the development of a brazing process for the first steel-shaft golf clubs in U. S.

His article in this issue shows the results of the last two decades, during which Mr. Gillette has been following resistance-welding research, having transferred to the G-E Works Laboratory development section in January, 1926. He holds a number of important patents on brazing and welding, and is a member of the Resistance Welding Standards Committee, A.W.S. He also is on the Executive Committee, A.W.S. and A.I.E.E.

A UNIT OF GEAR CUTTING MACHINERY WITH A COMPLETELY NEW GENERATOR

FOR CUTTING SMALL SPIRAL BEVEL, ZEROL BEVEL, HYPOID GEARS

The Gleason No. 2 Hypoid Generator . . . faster cutting . . . superior tooth bearing . . . production quantities or small jobs . . . closer control of actual cutting . . . heading a unit of equipment for the smooth production of bevel gears and hypoids for small tools and appliances.

The Gleason No. 4 Angular Bevel Tester . . . employed to check the rolling qualities, tooth spacing and concentricity of the cut gears.

The Gleason No. 7 Hypoid Cutter Sharpener . . used for the sharpening of the multi-blade circular cutters used in the No. 2 Hypoid Generator.

GLEASON Works
1000 University Avenue
Rochester 3, N.Y., U.S.A.

Builders of Bevel Gear Machinery for Over Eighty Years

NO. 2ML 3hp

Universal machine illustrated. Plain style also available. Catalog M-1662.

NO. 2MI 5hp

Universal machine illustrated. Plain and vertical styles also available. Catalog M-1662.

NO. 2 DIAL TYPE 7½hp

Universal machine illustrated. Plain and vertical styles also available; all styles with Medium or High Speed Range. Catalog M-1623-1.

Try this for size

In milling machines, size and power go together like chest goes with waist measurements in suits. Take the popular No. 2 size millers, for example. CINCINNATI offers them in *three power ratings:*

No. 2ML—3 hp

No. 2MI—5 hp

No. 2 Dial Type—7½ hp

You can save operating expense by choosing the power rating that fits your kind of work. And to accommodate the most common type of milling operations in your shop, you have a choice of styles:

No. 2ML { Plain / Universal

No. 2MI { Plain / Universal / Vertical

No. 2 Dial Type { Plain / Universal / Vertical

In other ways, too, you save with CINCINNATI: automatic individual lubricating system for vertical screw . . . independent, directional control levers help the operator avoid mistakes . . . Dynapoise overarms increase cutability. Write for literature and get the complete story.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

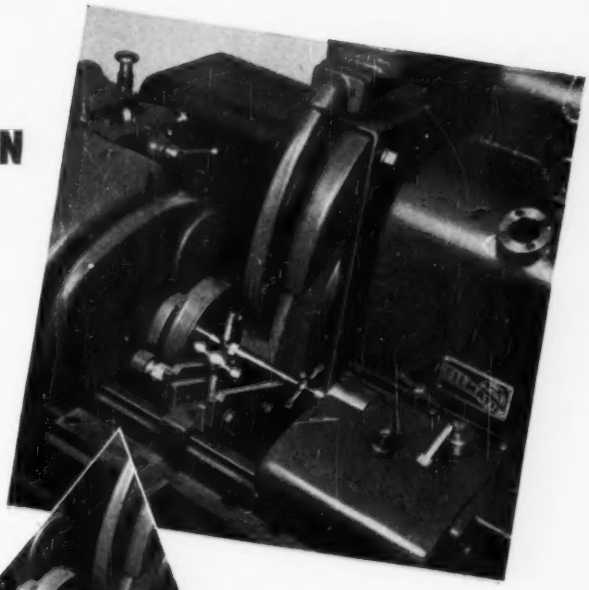
CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

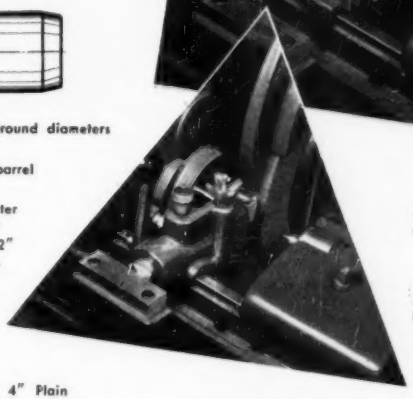
YOU GET HIGHER PRODUCTION when the operator can forget about the grinding cycle

Drawing of part, actual size. Ground diameters are indicated in color.

Part name.....Micrometer barrel
Material.....Steel
Operation.....Grind diameter and chamfer
Stock removal.....010" to .012"
Production.....200 per hour

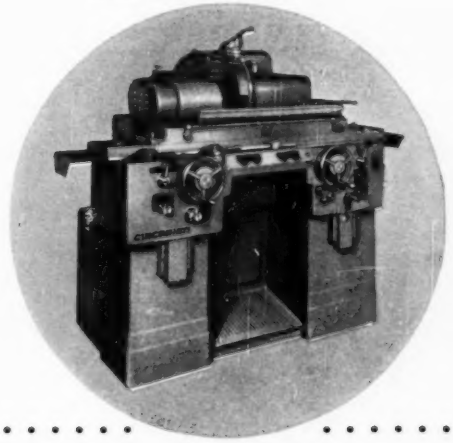


Above: Close-up of work, loading cradles, and hydraulic footstock.



Left: Close-up of cam controlled truing device.

Below: CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machine, equipped for automatic infeed grinding.



● Whether or not they're intentional, slowdowns hurt everybody. The unintentional ones occur when high production workers have to pay close attention to their machines. CINCINNATI has developed labor-aiding equipment for several types of grinding machines, which literally take over the job of paying minute attention to what's going on. One of them is illustrated here—a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder, with automatic infeed, hydraulic footstock, and loading cradles. Here's the way in which this equipment helps the operator grind 200 parts per hour.

> Place the mandreled work on the loading cradles, move the infeed lever slightly, and then forget about the remainder of the grinding cycle. It proceeds automatically.

Equipment of this type does not retard use of the machine for conventional traverse grinding. Most shops could use it. May we send booklet G-551-1?

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CINCINNATI

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

New Mastery of Costs on BIG GEARS

Here is a new Fellows machine . . . the 36-inch Gear Shaper . . . the rigid construction of which permits the taking of heavier cuts that set a new production pace, and a new and lower standard of costs in gear cutting.

A case in point is the large combined external and internal gear illustrated. Feeds as high as .0225" per stroke at 58 strokes per minute prove the ability of this machine to take fast, heavy, roughing cuts. A study of the tabulation below should whet the interest of those seeking to lower their costs in gear cutting.

	External Gear	Internal Gear
Material	SAE 3250 52 R-C	SAE 3250 52 R-C
Pitch diameter (inches)	37.166	34.666
No. of teeth	223	208
Diametral pitch	6	6
Pressure angle	20°	20°
Face width (inches)	2¼	1¾
Roughing cut (58 strokes per min.)	.0225" per stroke	.0225" per stroke
Finish cut (58 strokes per min.)	.027" per stroke	.027" per stroke (66 STROKES PER MINUTE)
TOTAL PRODUCTION TIME	2 hrs. 48 min. 45 sec.	2 hrs. 15 min.

We have even more data to offer in evidence of the remarkable production possibilities of the 36-inch Gear Shaper. Call or write our nearest office.

Fellows

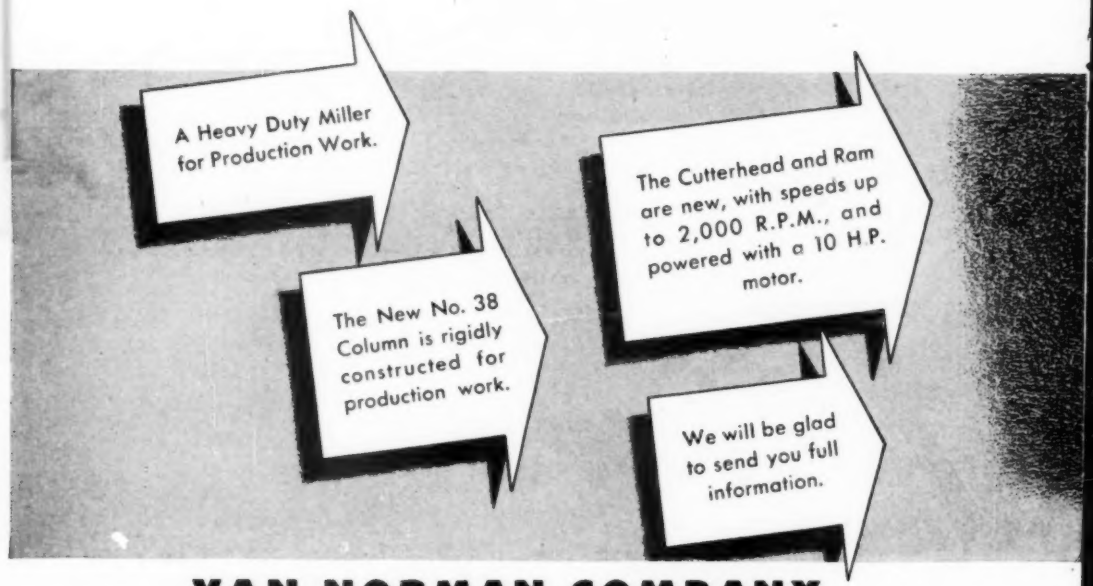
THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York 1.

Announcing the New

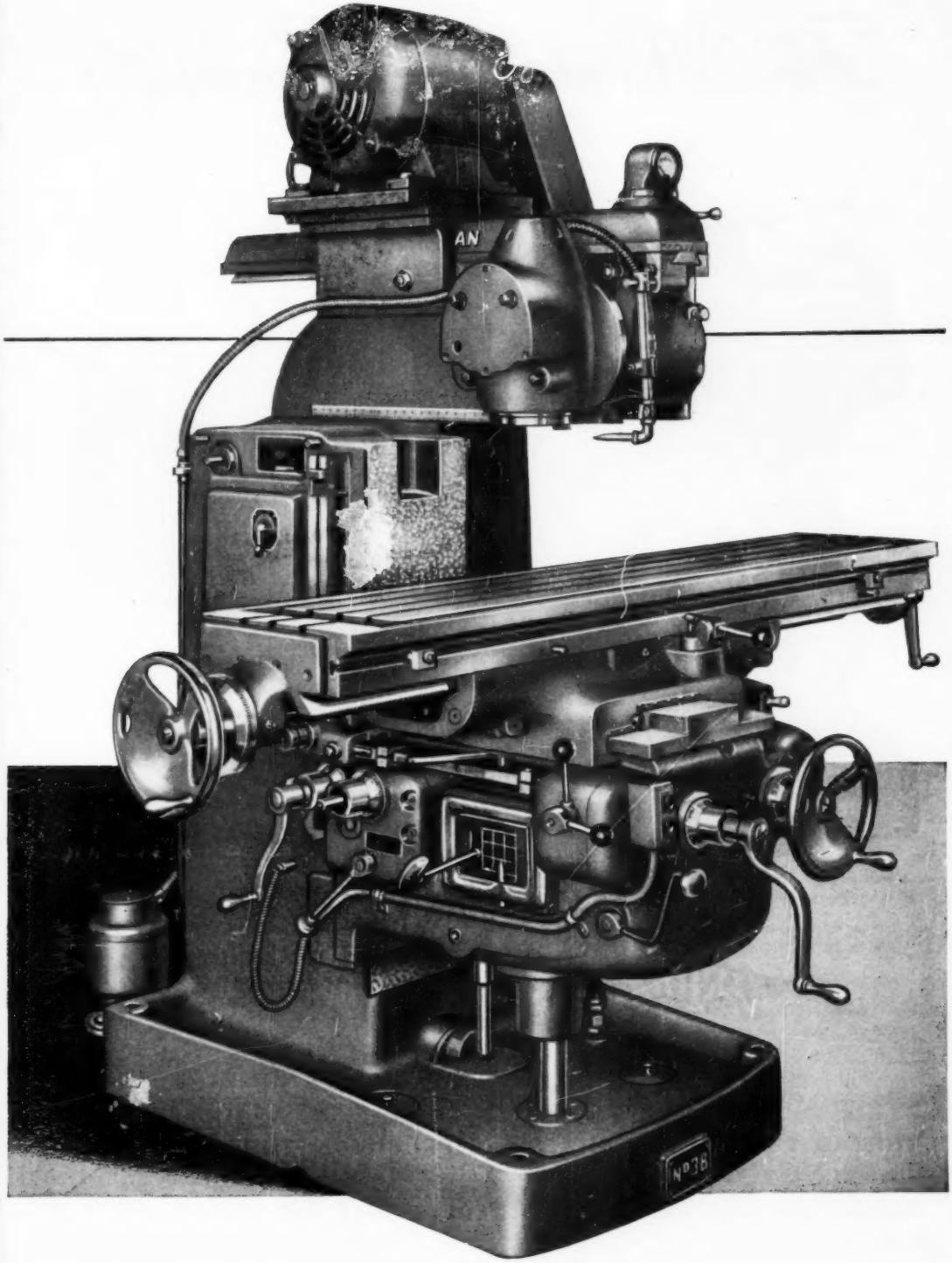
VAN NORMAN

No. 38

RAM TYPE MILLING MACHINE


A Heavy Duty Miller for Production Work.
The New No. 38 Column is rigidly constructed for production work.
The Cutterhead and Ram are new, with speeds up to 2,000 R.P.M., and powered with a 10 H.P. motor.
We will be glad to send you full information.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS


AN
No 3B

For Accuracy — Flexibility

LANDIS
REG. U.S. PAT. OFF. TRADE-MARK

LANDMACO
THREADING
MACHINE

THREAD CUTTING MACHINES • PRECISION THREAD GRINDERS

THREAD CUTTING DIE HEADS • COLLAPSIBLE AND ADJUSTABLE TAPS

—*Speed* In Thread Production

The LANDMACO Threading Machine is a precision tool capable of handling many threading operations much more economically than the heretofore slower and therefore more expensive methods.

It has many new and exclusive features which combine to assure the greatest possible degree of accuracy, ease of operation, and flexibility in making set-up changes.

The 1" and 1½" Single Head LANDMACO Threading Machine illustrated is also made in double and quadruple spindle models. The LANDMACO is also made in 2" and 2½" sizes in single and double spindle models.

The Lanco Thread Cutting Die Head, using the Landis Long Life Tangential Chaser . . . acclaimed "The Finest Thread Cutting Tool in Industry" . . . is standard equipment on the LANDMACO Threading Machine.

Write for Bulletin H-75

THE LANDIS CHASER

- **Single pulley drive**
- **Self-contained selective type gear box provides eight spindle speeds**
- **Flood lubrication for all gears and bearings**
- **Gear type pump direct driven and automatically reversible**
- **Built-in pump can be removed without disconnecting any piping**
- **Motor-in-base affords compact and efficient motor drive**
- **Friction clutch control**
- **Head opens and closes automatically**
- **Hand lever for opening and closing head**
- **Semi-steel bed of box type reinforced by inner walls**
- **Minimum die head overhang**
- **Adjustable vise easily lined up with spindle**
- **Oil reservoir lubricates guides through felt pads in carriage base**
- **Gibbed carriage compensates for wear**
- **The heavy rim of vise handwheel, giving flywheel effect, facilitates gripping of work**
- **Guards completely cover and protect guides**

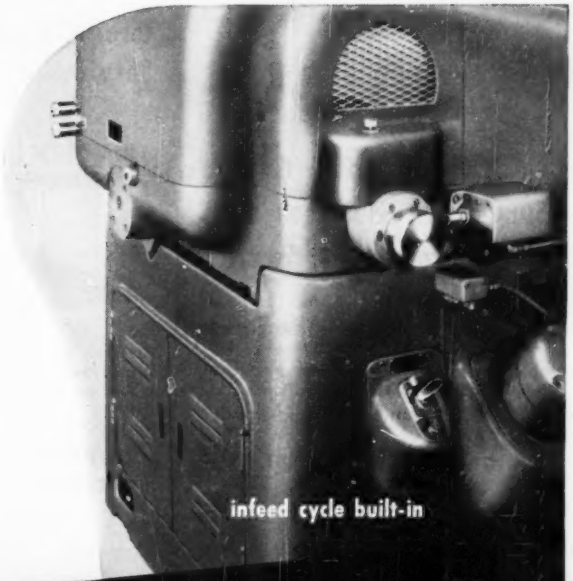
LANDIS MACHINE COMPANY
WAYNESBORO · PENNA · U·S·A·

No. 12 Centerless Grinder equipped with automatic infeed cycle and air operated work ejector. Catalog T47 describes basic machine.

LANDIS TOOL

Precision Grinders

If you have an infeed grinding problem or other precision grinding problem, production estimates and tooling suggestions will be made on the basis of your blueprints.



infeed cycle built-in

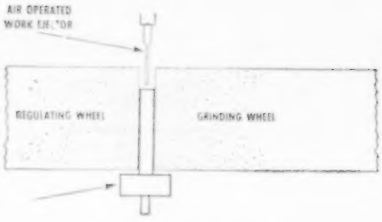
LANDIS TOOL

No. 12 centerless grinder features

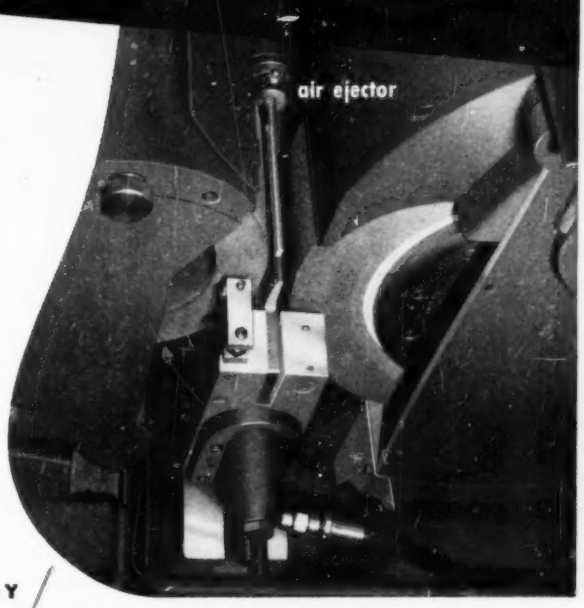
Microsphere spindle bearings for both wheel spindles.
V Belt drives
Hydraulically operated wheel dressers
Work rest solidly mounted on bed
Electrically controlled variable speed regulating wheel drive

LANDIS TOOL "PACE SETTER" Automatic Cycle

Makes Centerless Infeed Grinding More Productive



typical work set-up



air ejector

LANDIS TOOL COMPANY
10 E. SIXTH ST. / WAYNESBORO, PENNA.

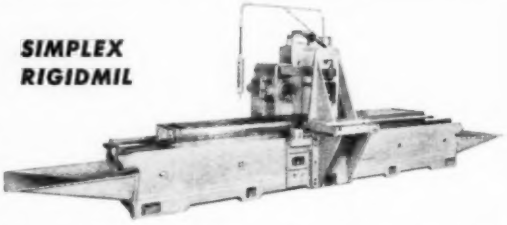
How to Cut

Your Metal Working Costs with Sundstrand Machines and "Engineered Production" Service

Here are some representative examples of machine tools and services offered by the Machine Tool Division of Sundstrand. Standard basic machine designs and units, coupled with methods engineering assistance, has resulted in many cost-saving Sundstrand installations. If you have metalworking operations in your plant, and are interested in lowering manufacturing costs, call in a Sundstrand representative. He'll be glad to assist you in obtaining more economical methods. There is no obligation for this service.

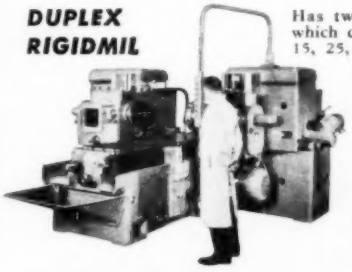
These Machines Plus Engineering Service to Solve Milling Problems...

SIMPLEX RIGIDMIL



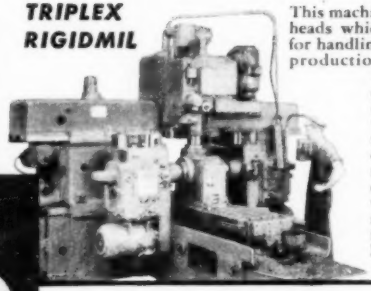
Performs slab or face milling with single spindle. Can be furnished with 25, 30, 40, 50 or 75 horsepower heads. Table widths are 18", 24", or 30", with feed strokes up to 144 inches.

DUPLEX RIGIDMIL

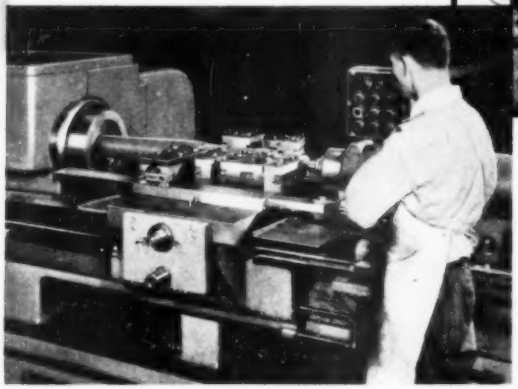


Has two opposed heads which can be furnished in 15, 25, 30, 40 or 50 HP capacities. Table widths and feeds are same as Simplex Rigidmil. Spindle heads mounted onadjustable columns to facilitate wider range of work. Machines can be furnished with power adjusted or fixed columns.

TRIPLEX RIGIDMIL



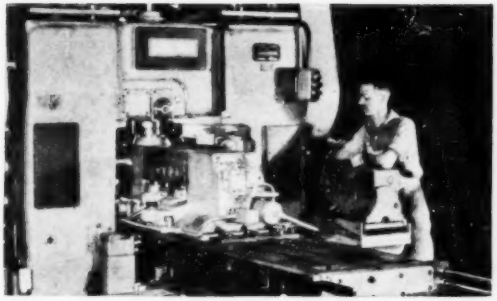
This machine has adjustable heads which add flexibility for handling wider range of production milling jobs. Heads can be operated to mill three sides of a work piece simultaneously or operate individually. Capacity of heads, table widths and feed strokes same as for Simplex Rigidmil.



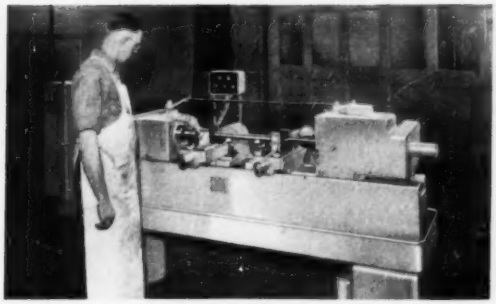
For *Both* Short-Run and Mass Production, Use Sundstrand Automatic Lathes and Engineering Assistance Models 4, 8, 10, 12 and 16 single spindle automatic lathes handle a wide variety of short or long run turning, boring, facing or forming operations. Can be furnished with one, two or three tool heads. Available in varying speed combinations and lengths, with work capacities ranging from 3 to 75 HP.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

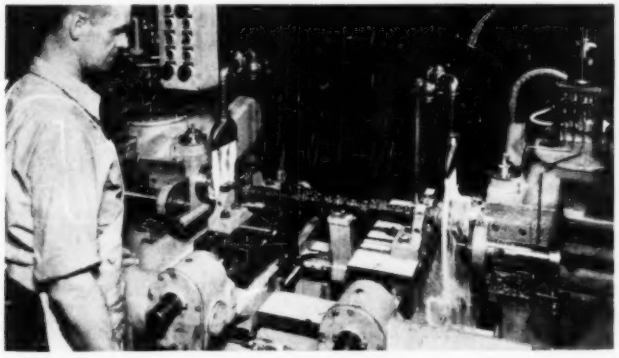
RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



Special Machines for Milling, Turning, Boring, Centering When standard machines cannot be tooled to suit your needs, or if your production requires the purchase of too many duplicate standard machines, ask Sundstrand engineers to work out a practical solution in the form of a special machine tool. For instance, the machine illustrated above was designed to mill 3 sides of automobile cylinder blocks. Machine has a full automatic cycle.



Centering Machines with Hand or Power Feed Designed and built to drill or center one or both ends of work-pieces prior to turning or other machining operations. Can be furnished with either power or hand control and with a combination of power feed and hand operated vises, or manual feed and power operated vises.



Milling and Centering Machine If your work includes milling to length and centering of either big parts or small parts, you will save time and get more accurate work with a Sundstrand Milling and Centering Machine. It saves time, becuase it mills to length and centers in the same set-up. The work is handled once instead of twice. Extreme accuracy is obtained by performing *both* operations with a single clamping of the part, thereby maintaining a definite relation between the ends and centers.

Shown is a Sundstrand Milling and Centering Machine for handling a range of work from 1" to 3½" diameter and 8" to 48" long. Other sizes of similar machines are available.

Balancing Tools

For balancing, straightening and truing operations . . . Made in 8 standard sizes and types carrying two accurately ground discs mounted on hardened and ground spindles. All discs are carefully balanced, accurately ground and sensitively mounted for true rotation.

Bench Centers

For testing and checking parts between centers. Each bench center includes the bed and two heads. Complete range as follows: 6" by 18", 6" by 36", 12" by 36", 12" by 48", 12" by 60" and 12" by 72".

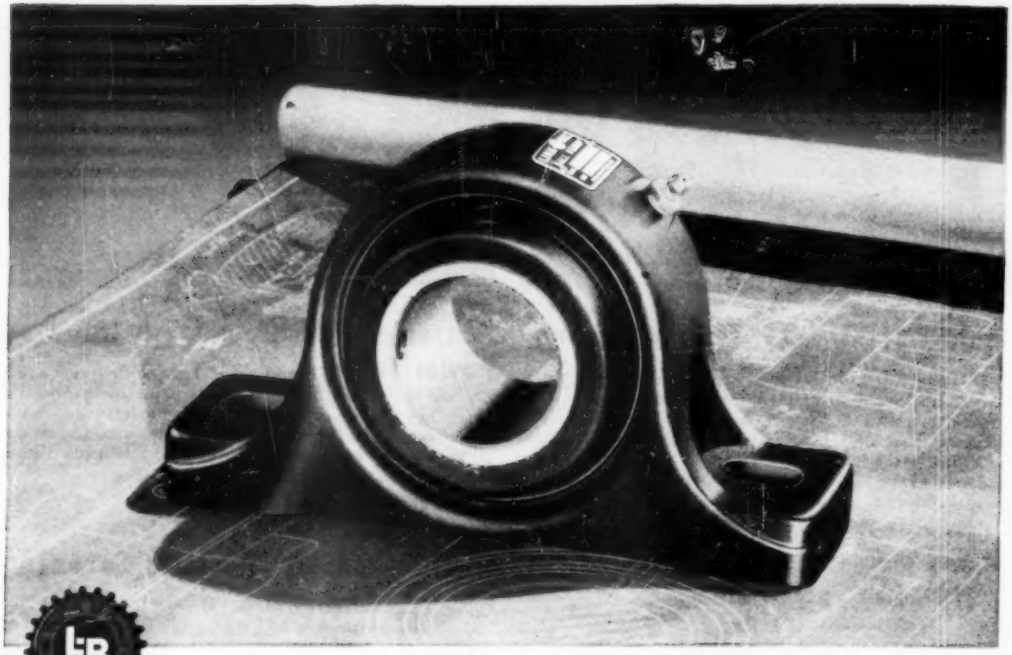
FREE Complete Data

on any or all of these machines is available. For complete set of literature ask for Bulletins 179.

SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES



TAKE *QUALITY* FOR GRANTED

SPECIFY *LINK-BELT* BALL AND ROLLER BEARINGS

You can **Depend** upon LINK-BELT for:

1 QUALITY
2 PERFORMANCE
3 ECONOMY
4 ACCEPTANCE
5 COMPLETENESS
6 SERVICE

There's no question about the high quality of Link-Belt Ball and Roller Bearings.

Considering the precision manufacturing processes, the skilled use of the most modern equipment under closest control, and the years of scientific research to furnish industry with longer-lasting, more efficient bearings, it is little wonder that "Link-Belt" quality is unquestioned.

Eliminate all guesswork — specify "Link-Belt" on your next bearing order. Choose with the utmost confidence from the COMPLETE Link-Belt line . . . various mountings and sizes for practically all types of industrial applications.

Good supplies of these popular bearings await your commands at distributor's and Link-Belt stockrooms throughout the nation.

11.327

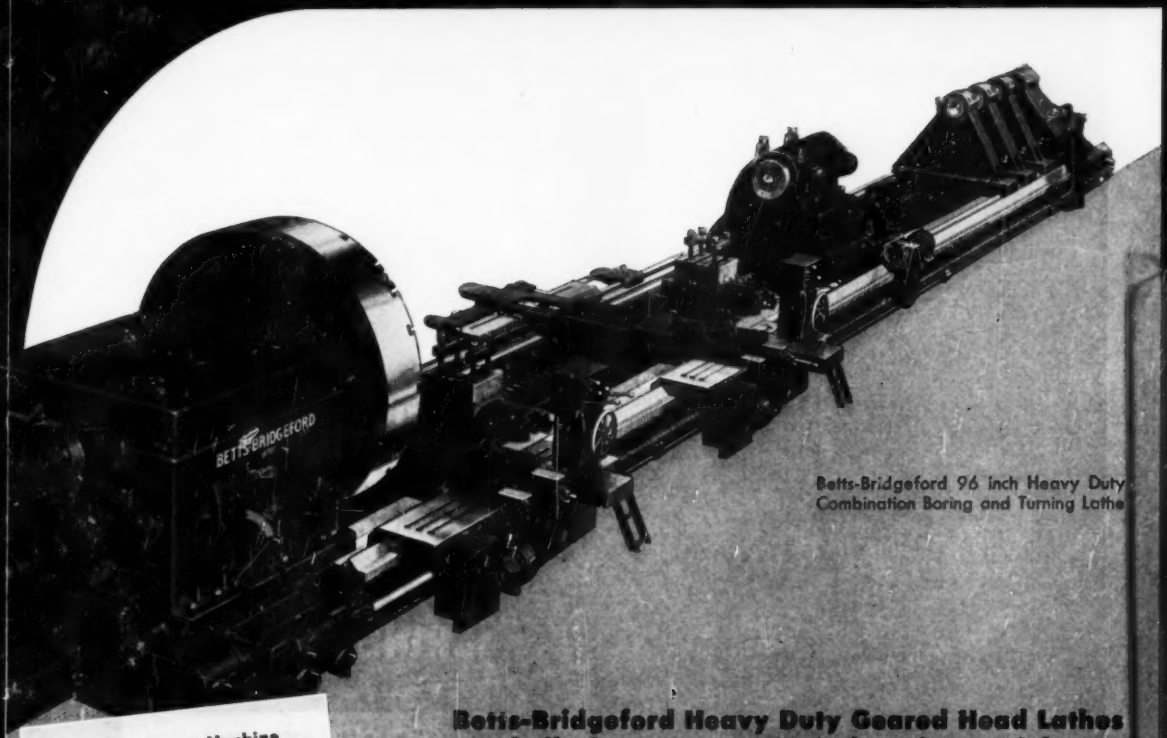
Free Catalogs On Request!

LINK-BELT COMPANY

Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8.

LINK-BELT BALL AND ROLLER BEARINGS

BETTS-BRIDGEFORD
Heavy Duty Geared Head
LATHES



Betts-Bridgeford 96 inch Heavy Duty Combination Boring and Turning Lathe

Betts-Bridgeford Heavy Duty Geared Head Lathes are built from 26 to 144 inch swing and larger

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

An earnest effort to produce the world's finest heavy duty machine tools has gone far to establish Consolidated's enviable reputation for designing and building heavy duty geared head lathes . . . a record of achievement extending back to the first Betts-Bridgeford Geared Head Lathe built in 1905. Today's Betts-Bridgeford Lathes have every advanced feature required for modern high production, accuracy and durability.

Full information covering any size Betts-Bridgeford Heavy Duty Lathe will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

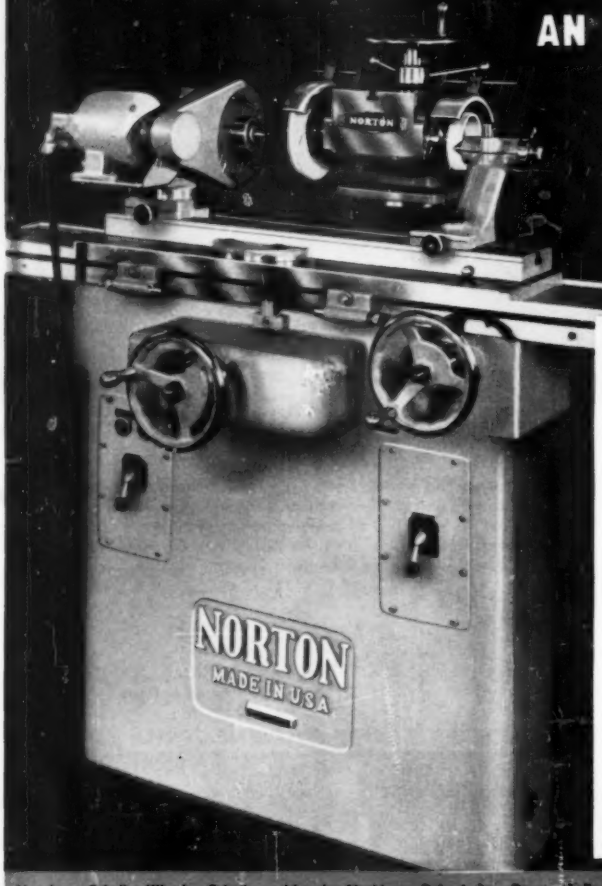
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

the *new* TILTING WHEEL HEAD..

AN EXCLUSIVE FEATURE ON THE *NEW* NORTON No. 20 CUTTER and TOOL GRINDER



HERE are a few of the entirely new features offered in this new Norton Cutter and Tool Grinder:

- Greater length of table traverse
- Greater wheel slide travel
- Integral motor spindle—1 h.p.
- TILTING WHEEL HEAD
- Centrally located column elevating hand wheel
- Wheel slide graduated dials easily read from any position
- Automatically lubricated table ways
- Electric equipment to Machine Tool Builders' Standards
- Wheel spindle reversing switch (optional) for carbide grinding

Catalog on new Norton No. 20 Cutter and Tool Grinder on request—no obligation.

Abrasives - Grinding Wheels - Grinding and Lapping Machines - Refractories - Pumps - Pulleys - Non-slip Floors - Coated Products - Labeling Machines

. . . simplifies Cutter and Tool grinding!

Two Typical Setups Made Easier by the Norton Tilting Wheel Head

FACE MILLING CUTTER

1 Tilt Wheel Head up for desired clearance angle

2 Mount finger rest on universal work head and level tooth of cutter

3 Grind face milling cutter

PLANER MILLING CUTTER

1 Tilt Wheel Head down for desired clearance angle

2 Mount finger on column and bring to work center height

3 Grind 5 x 10″ planer milling cutter

M-571

NORTON GRINDERS and Lappers

NORTON COMPANY, WORCESTER 6, MASS. • New York • Chicago • Detroit • Cleveland • Hartford • Distributors in All Principal Cities

RIGIDITY
that Assures Accuracy

FOSDICK
Upright
DRILL

Illustrated is a new Fosdick 25" Upright Drill in the plant of a prominent automobile manufacturer. The machine is being used to drill numerous small holes in motor heads.

Note the massive spindle made of heat treated alloy steel. The spindle sleeve is equipped for attachment of multiple drill heads. The spindle sleeve has a bearing in the sliding head equal to head bearing on the column. This assures rigidity for accurate drilling, reaming, boring and similar operations.

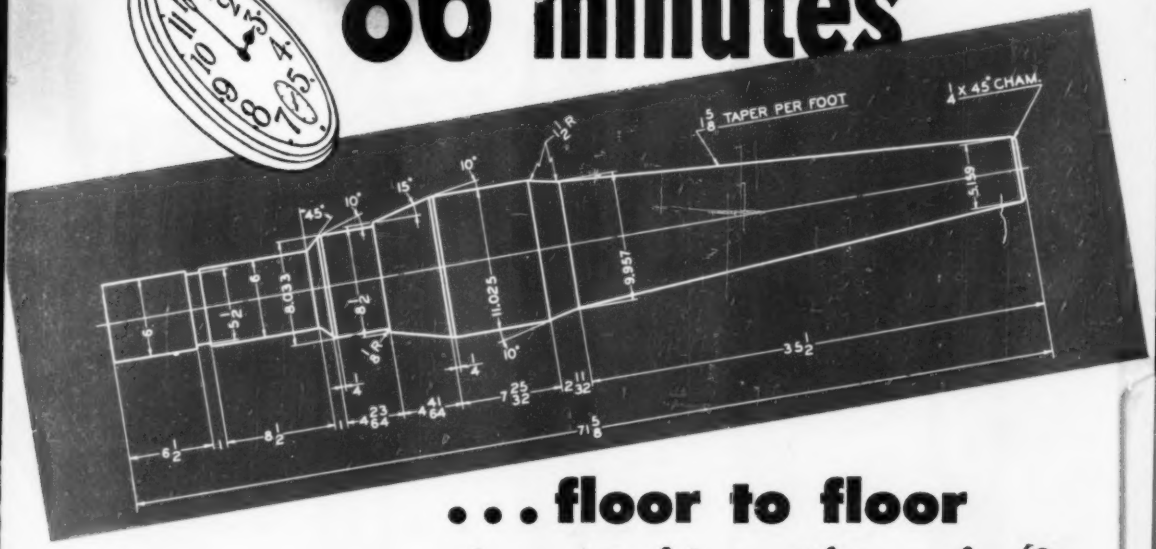
The machine is normally furnished with 12 speeds ranging from 60 to 1500 R.P.M. and nine feeds from .005" to .043" per revolution of spindle. Both feeds and speeds are controlled by single direct reading levers.

For utmost in precision and productive capacity put your drilling operations on a Fosdick Upright Drill.

Ask for
FOSDICK
Upright
Bulletin
U.D.A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

86 minutes



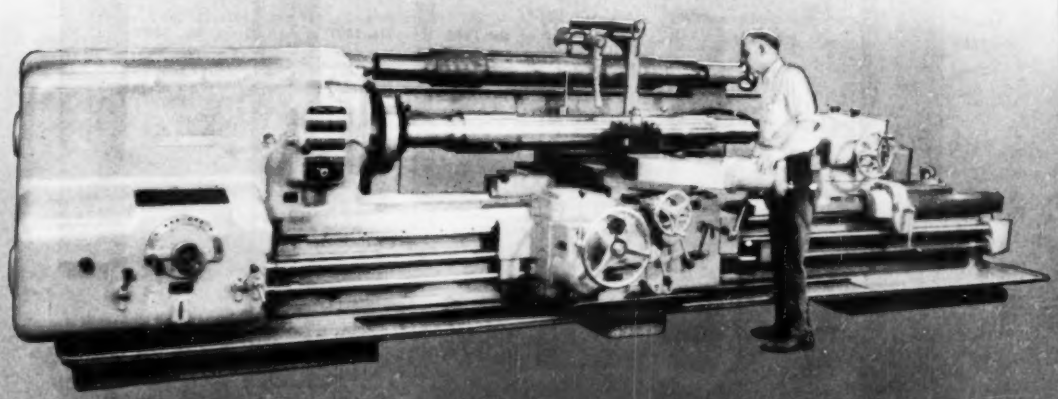
. . . floor to floor

to machine this shaft

This represents an amazing saving over previous methods and proves conclusively that the new "AMERICAN" Hydraulic Duplicating technique is a positive answer to production and cost problems.

The new 25-inch "AMERICAN" Hydraulic Duplicator on which this job was done has the enormous power, the unfaltering stamina and the ease of control which combine to make it the production marvel of the moment. Cost-minded executives from every quarter of this country and from many countries abroad have shown vital interest in this new machine. Many orders already have been placed and many machines now are in service breaking production records daily.

Complete descriptive data will be sent immediately upon request. For convenience just ask for Bulletin No. 35.



THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

No. 1895

No. 1896

No. 1900

No. 1903

No. 1902

No. 1895—Hi-Helix Double End Mill. Four flutes. For general end milling.

No. 1887—Hi-Helix Ball End Mill. Two flutes. For milling fillets, round bottom holes, radius-bottom slots, etc.

No. 1896—Hi-Helix Double End Mill. Two flutes. Ideal for milling keyways, slots, channels, etc.

No. 1898—Hi-Helix Single End Mill. Two flutes. For milling keyways and slots from the solid, can be fed directly into work without previous drilling operation.

No. 1900—Hi-Helix Long Single End Mill. For milling out slots, recesses, etc., that cannot be reached by regular length mills.

No. 1895—Small Diameter Hi-Helix Double End Mill. Four flutes.

No. 1896—Small Diameter Hi-Helix Double End Mill. Two flutes.

No. 1903—Hi-Helix Long Single End Mill. Right hand cut—left hand spiral. The tool for deep slots where regular length mills will not reach.

No. 1897—Hi-Helix Single End Mill. For general end milling.

No. 1902—Hi-Helix Single End Mill. Right hand cut—left hand spiral. Used in die work, etc.

No. 1899—Hi-Helix Long Single End Mill. Two flutes. For deep milling of slots which cannot be reached with ordinary length mill.

No. 1887

No. 1898

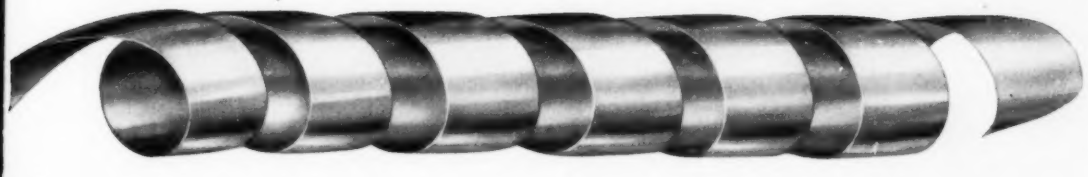
No. 1895

No. 1896

No. 1897

No. 1899

You Can CA$H These Chips



. . . because

They Can't Clog the Flutes

of MORSE Hi-Helix END MILLS

Yes, chips like these have a definite cash value to endmill users. For the shear-cutting action of the exclusive Morse Hi-Helix design curls up and rolls out the chips . . . easily, evenly . . . *without ever clogging the flutes.* So mill-life is longer. And cutting action is smoother, swifter, chatter-free . . . even on the toughest jobs.

On run-of-the-mill jobs, too, Morse delivers the same top performance. That's because Hi-Helix End Mills are properly undercut and ground with primary and secondary clearance. Then add Morse's specially heat-treated 18-4-1 High Speed Steel, and you have extreme toughness without any sacrifice of cutting ability.

So on any endmill problem, *"mark it for Morse,"* and ask your Industrial Supply Distributor.

And if your problems require Morse Engineering Service, remember that this service is always yours for the asking.

SOLD EXCLUSIVELY THROUGH MORSE-FRANCHISED DISTRIBUTORS

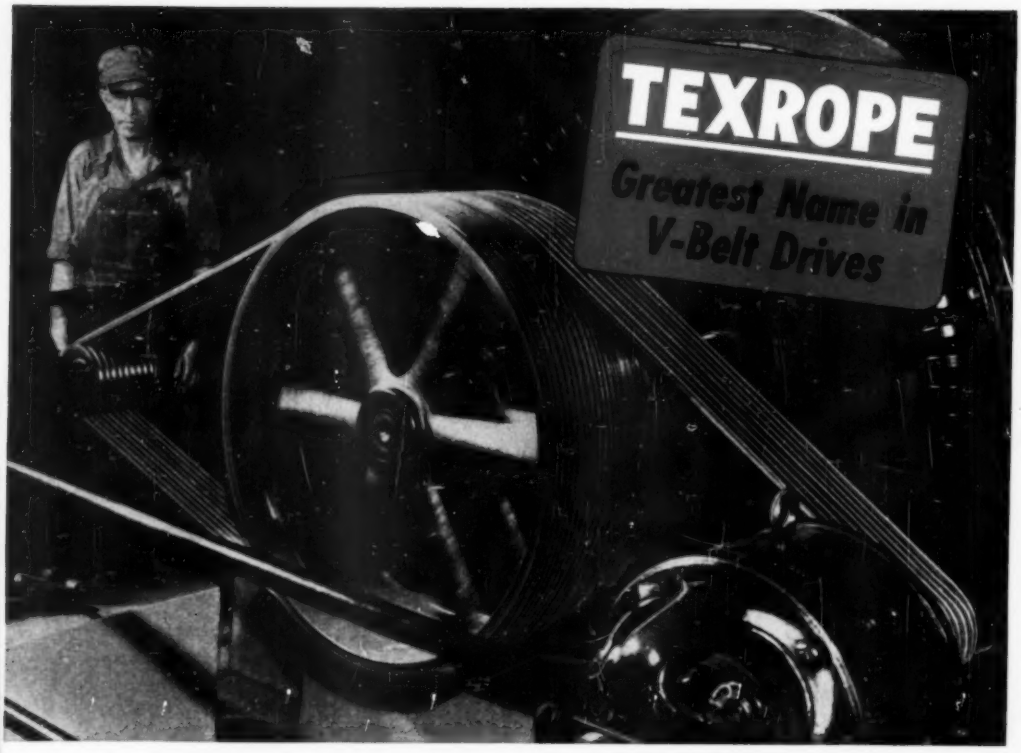
Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

NEW BEDFORD, MASSACHUSETTS

A DIVISION OF VAN NORMAN COMPANY

BRANCH WAREHOUSES: NEW YORK, DETROIT, CHICAGO, SAN FRANCISCO



17 Years..ONE SET OF BELTS!

TEXROPE ENGINEERING skill and experience really paid off on this exciter drive. Installed in 1929, *not one cent* was spent on maintenance for over 17 years.

You can lower drive costs by putting a *Texrope* engineer to work on your drive problems. More *Texrope* V-belt drives have been installed in industry than any other kind, so *Texrope* engineers have solved problems like yours many times. Proof of their skill is in performance records like this.

Widest Range of Products — Only *Texrope* drives give you *everything* you need in V-belt drive equipment . . . belts . . . fixed and variable pitch sheaves . . . and speed changers. In every group the *Texrope* line offers the widest range of sizes and models.

Send for Pre-engineered Drive Manual — Vast *Texrope* experience has been condensed into 144 page book that covers 90% of all V-belt drives. See your Allis-Chalmers Authorized Dealer or District Office or write today. Ask for Bulletin 20B6956. Also listed in Sweet's.

Texrope Super-7 V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices. *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks. A 2593

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and District Offices throughout the country.

MOTORS — ½ to 25,000 HP and up. Matching Allis-Chalmers Control.

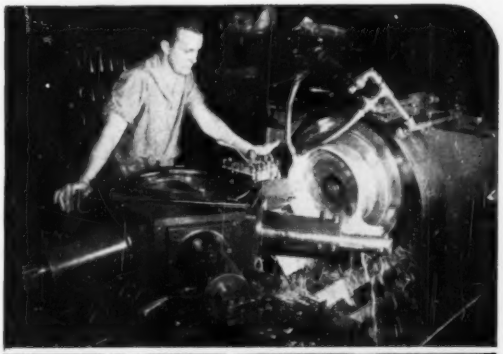
TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

You can machine it

Better!

★ Precision is the keynote in production of centrifugal liquid separators at the Sharples Corporation, Philadelphia. That is why they use so many Warner & Swasey Turret Lathes. Their rigidity holds extreme accuracy and produces fine finishes on typical large chucking operations like the one shown here, where a Warner & Swasey 4-A equipped with cross sliding hex turret turns, bores and internal faces this stainless steel ring to tolerance of plus or minus .0005".

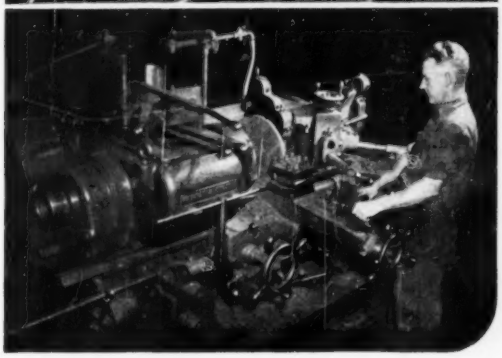


Faster!

★ The Gravely Motor Plow & Cultivator Co., Dunbar, W. Va., wanted fast production to meet accumulated demand for thousands of power-driven hand tractors and attachments. Production jumped 75% when new No. 2-A Warner & Swasey Turret Lathes took over the job of turning out cylinder blocks. Warner & Swasey's greater power safely delivers heavier cuts at higher speeds. Ease of handling decreases operator fatigue, permitting continuous top levels of output. High precision cuts down scrap loss. These all add up to faster production.

for Less!

★ This Warner & Swasey No. 2-A Turret Lathe has been used by the F. X. Hooper Company, Glenarm, Md., for over a decade without even the head cover being removed. Yet it still holds accuracy and is *efficiently* turning out all types of parts, such as a retaining washer, shown here, which calls for facing, drilling, boring and counterboring. This 10-year record of trouble-free, low-cost service is typical of the economies you may expect when you invest in new Warner & Swasey Turret Lathes.



. . . . with a Warner & Swasey

WARNER & SWASEY
Machine Tools
Cleveland

TURRET LATHES. MULTIPLE & SINGLE SPINDLE AUTOMATICS. PRECISION TAPPING AND THREADING MACHINES

DIES

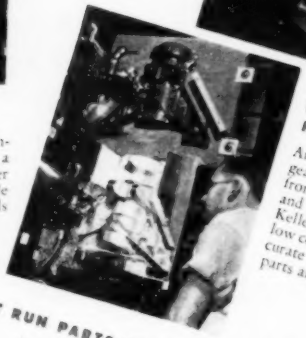
This is a forging die cavity for jet engine impeller blades. P&W Keller Machines cut thousands of forging dies, some simple and some very complex. Tracer-controlled milling — Kellering — does the job economically.

MOLDS

This steel mold for a precision aluminum casting is being cut from a wood master. Plaster or any other readily worked material is suitable for the master form. Plastic molds are made the same way.

PATTERNS

Here are two metal manifold patterns being cut simultaneously from a wood master pattern. Kellering is the quick way to get into production.

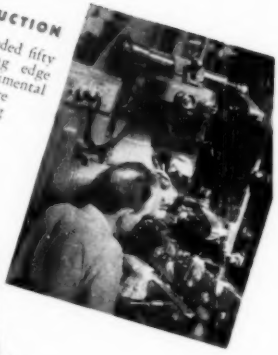


EXPERIMENTAL PARTS

An aircraft landing gear part being cut from a solid steel billet and a wood master. Kellering is the fast low cost way to get accurate finished test parts and pilot models.

SHORT RUN PARTS PRODUCTION

An aircraft company needed fifty magnesium wing leading edge segments for a new experimental plane. Angles and shape were complicated but Kellering solved it easily.



KELLERING

RINGS UP PROFITS

on ALL these DIFFERENT jobs

This is the Pratt & Whitney Keller, Type BL, that is duplicating and double-duplicating its original investment in short order. This one machine can handle *any* of the many kinds of work shown here. Toolrooms, tool and die shops, mold shops, and experimental departments all profit by Kellering.

It will pay you to look into the time and cost saving possibilities of Kellering. May we send you our latest Bulletin on the Type BL Keller? There is no obligation.

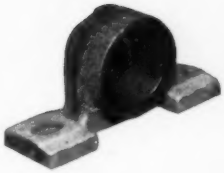
Pratt & Whitney

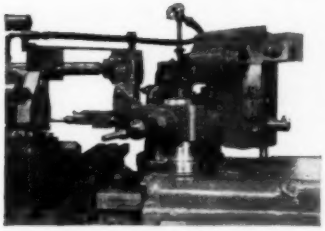
Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

Keller Machines

Take this Cast Iron Pillow Block





Apply this P&J Chucking and Tooling

The work is held in an air-operated combination chuck and fixture. Then:

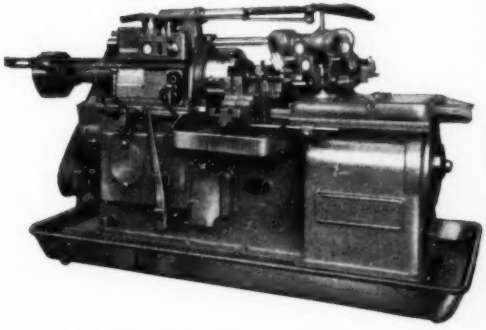
1st T. F.: Rough bore hole and two counterbores; chamfer O. D. of Hub

2nd T. F.: Finish above cuts; chamfer counterbore

3rd T. F.: Machine oil slinger groove; machine snap ring groove; rough form ball race and face end

4th T. F.: Machine ball radius with single point tool

5th T. F.: Size bore counterbore



Do The Job With Maximum Speed At Minimum Cost On This Powerful, Precise P&J 4DE Automatic Turret Lathe with 15 changes of speed arranged in 5 sets of 3 automatic changes; 27 feeds arranged in geometric progression; built for permanency of alignment, freedom from scoring, and long life.

WRITE FOR BULLETIN GIVING COMPLETE SPECIFICATIONS

ALL THIS *Precision Work* DONE IN 2.28 MINUTES WITH P&J High Production Tooling ON THE P&J 4DE AUTOMATIC

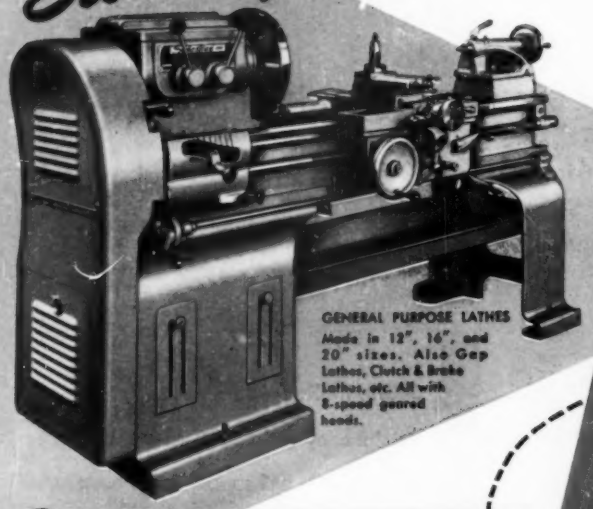
Skilful tooling—the ability to group and combine operations, often on a single turret face—is the secret of the outstanding success with which Potter & Johnston combines high precision with high speed and consequent low cost parts production.

That is why you may find it very much worth your while to submit your parts or prints to P&J for tooling suggestions, estimates and time studies. It involves you in no obligation and may uncover savings of truly great significance.

Potter & Johnston Company
Pawtucket, R. I.
subsidiary of Pratt & Whitney
Division Niles-Bement-Pond Company

Before You Buy Any Other Medium-Priced Lathe...

See what you get with a Sebastian TYPE "R" GEARED HEAD LATHE



GENERAL PURPOSE LATHES
Made in 12", 16", and 20" sizes. Also Gap Lathes, Clutch & Brake Lathes, etc. All with 8-speed geared heads.

1 ALL OF THESE ITEMS ARE SUPPLIED AS STANDARD EQUIPMENT, INCLUDED IN BASIC LATHE PRICE:

MOTOR & WIRING
REVERSING SWITCH
COOLANT PANS
SPINDLE SLEEVE
THREADING DIPTH STOP
LEVELING SCREWS & PLATES
CABINET LEG • TOOL POST
FACE PLATE • DOG PLATE
CENTERS • WRENCHES

In addition to above items, Apron Control and Center Leg are also included as standard equipment on lathes with 10', 12' and 14' beds.

2 OUTSTANDING FEATURES

TIMKEN TAPERED ROLLER BEARINGS (pre-loaded) on all shafts in headstock, including spindle, assuring extra-high accuracy and 20% more power.

OVERSIZED, HEAT-TREATED STEEL GEARS in headstock, assuring longer life and a powerful head.

AUTOMATIC SPLASH LUBRICATION for all gears in headstock.

NEUTRAL POINT IN HEAD permits revolving spindle freely by hand for chucking work.

LARGE HOLE through spindle.

APRON CONTROL for start, stop, and reverse of lathe spindle. (Standard on lathes with 10', 12', and 14' beds.)

REVERSE IN APRON for feeds.

TAPER GIBS throughout.

CROSS-FEED AND COMPOUND-REST DIALS are friction type and graduated. No set screws to tighten.

57 FEED AND THREAD CHANGES.

3

Manufactured By KING — BUILDERS OF WORLD-RENOWNED "KING" BORING & TURNING MACHINES

Built in the ultra-modern King plant, made to traditional King precision standards, the new medium-priced Sebastian Lathe incorporates every big lathe feature contributing to higher accuracy, ease of operation, longer service life. See your Sebastian Dealer... and write today for "just off the press" Catalog S-1 (Standard Type "R" Lathes) and Catalog S-101 (Special Type "R" Lathes—Gap, Clutch & Brake, etc.)

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

Where success depends on accuracy...

Production men the world over turn to Jacobs Chucks as naturally as the die maker to his instruments when *precision* is prerequisite to success. Their powerful grip holds tools tight and true...their rugged construction maintains accuracy over a long service life. The Jacobs Plain Bearing Chuck has long been the world-wide favorite as original equipment with manufacturers of portable tools and drilling machinery. Stocked by your Industrial Supply Distributor. The Jacobs Manufacturing Company, Hartford 2, Connecticut.

If it's a JACOBS, it holds

FOREMOST IN CHUCKS · FIRMEST IN GRIP

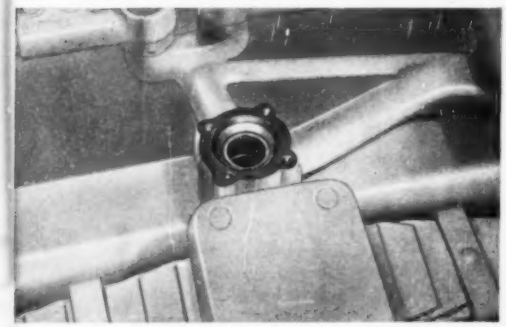
Jacobs Chucks

Torrington Needle Bearings

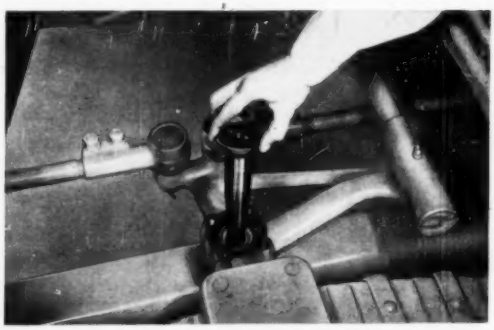
Keep Upkeep Down

in Caterpillar Tractors

Heavy farm chores and tough construction jobs are a matter of course for Caterpillar Diesel DW10 Tractors. One feature owners like is a rugged design needing little upkeep. In governor, steering gear and steering bellcrank, long service life is secured with efficient Torrington Needle Bearings.



The bellcrank application in steering control shows how these high-capacity, anti-friction units fit into compact designs. Two Needle Bearings mounted with close fits keep mating parts in alignment. Freedom from wear maintains close bearing clearances and eliminates the need for readjustment.



Related parts of the assembly are simple—a plain machined bore for a housing, a hardened and ground shaft for an inner race. Fabrication is easy, and installation a quick arbor press operation. No retaining devices are needed. Such Needle Bearing features help keep manufacturing costs down.

Machinery you build or operate can be improved in operation and service life with Torrington Needle Bearings. Consult our engineers on your specific application requirements. THE TORRINGTON COMPANY, Torrington, Conn. or South Bend 21, Ind. District offices and distributors in principal cities.

TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller Straight Roller • Ball • Needle Rollers

BETHLEHEM TOOL ROOM

BTR

The Safe-Hardening Tool Steel

Serves WEST COAST INDUSTRIES

In this die-storage crib at National Motor Bearing Co., Inc., Redwood City, Calif., are stored many hundreds of drawing, forming and blanking dies used to produce parts from sheet steel for oil and fluid seals ranging from ¾ in. to 14 in. in diameter. BTR is used for five of the six parts which make up each die. Inset shows a typical oil seal with mounting bracket.

BTR is a toolroom favorite from coast to coast. And for good reason.

SAFE-HARDENING. It hardens in oil at the low temperature of 1475 F, reducing cracking hazards.

EASY TO MACHINE AND HEAT-TREAT. Annealed to 202 Brinell for easy machining, it is easy to heat-treat for working hardnesses up to 62 Rockwell C.

TOUGH AND WEAR-RESISTING. It's a general-purpose grade, especially good for jobs that call for shock-resistance and long runs.

LOW DISTORTION IN HEAT-TREATMENT. For extra accuracy, you can depend on it for low distortional characteristics.

Best of all, BTR is economical. It is deep-hardening, holds a durable cutting edge. Its general utility in the tool-room makes it a mighty handy grade to keep on hand. Use it for a wide range of tools and dies.

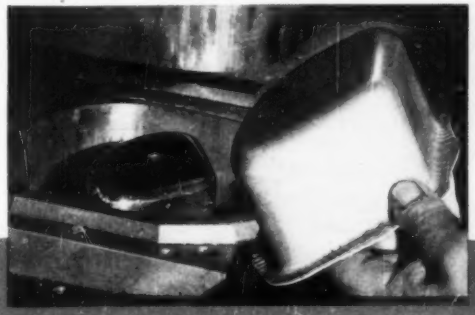
Call your nearest Bethlehem Tool Steel distributor or Bethlehem sales office today for full details. Prompt deliveries from local stocks.

Typical Analysis:

C	Mn	W	Cr	V
0.90	1.20	0.50	0.50	0.20

In a single operation these BTR piercing dies put 125 holes in the aluminum accessory for pressure cookers (shown at far right). Known as "Jack & Jill Triplets," these are made by Mars Engineering and Manufacturing Co., Burbank, Calif. The punches were in excellent alignment after heat-treatment, show little wear after producing 165,000 pieces without any regrinding.

The BTR die shown below is used to blank and draw .032 inch aluminum stock (3 SO grade). By using BTR, the fit between the die halves can be kept within predictable close tolerances to assure proper flow of the metal during the draw, producing a clean surface and uniform thickness on this deep, one-stroke draw. This die has produced over a half-million pieces.



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

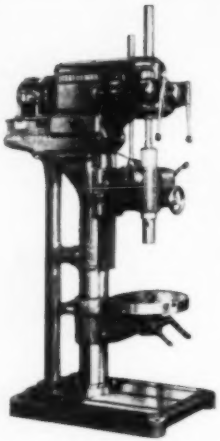
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BTR . . . one of Bethlehem's Fine Tool Steels

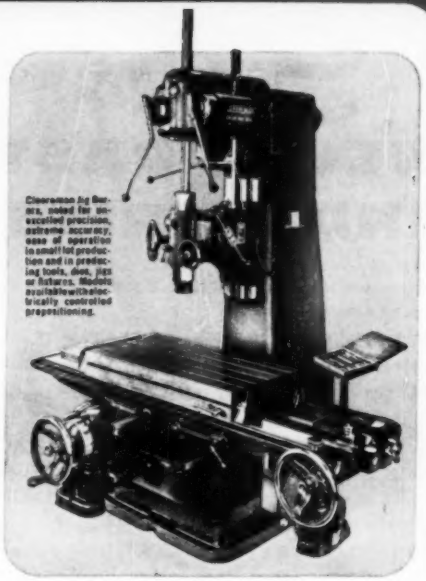
THE CLEEREMAN LINE

OF PRECISION JIG BORERS and DRILLING MACHINES



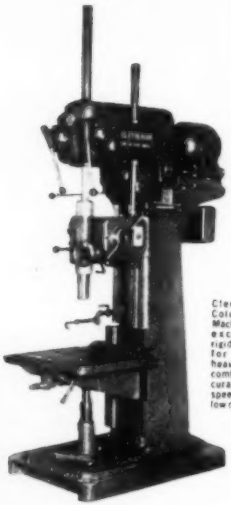
Cleereman Round Column Drilling Machines produce accurate holes at high speed and at low cost and are general purpose machines with high production.

Cleereman Model 325 Single Unit Sliding Head Drilling Machines combine extreme sensitivity with rugged construction, are extremely versatile and may be used for production drilling and tapping.



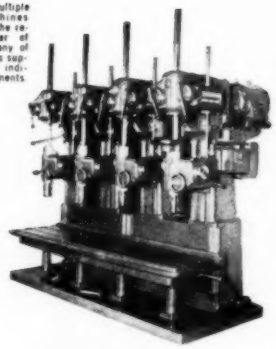
Cleereman Jig Borers, noted for unexcelled precision, extreme accuracy, ease of operation in small lot production and in producing tools, dies, jigs or fixtures. Models available with electrically controlled repositioning.

for
Speed
Accuracy
Adaptability



Cleereman Box Column Drilling Machines have an exceptionally rigid construction for continuous heavy duty work combined with accuracy and the speed required for low cost production.

Cleereman Multiple Drilling Machines consisting of the required number of machines of any of the three types supplied to meet individual requirements.



BRYANT
Machinery & Engineering
Company

General Office
400 West Madison Street Chicago 6
Representatives in Principal Cities

Affiliated with—

CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.

BUILDERS OF PRECISION JIG BORERS & DRILLING MACHINES

What's in
VERMONT
this month?

YOUR MACHINE TOOLS OF THE FUTURE

The overhead shaft with long, flapping belts has gone. It gave way to a revolutionary development — an independent motor on each machine. This was only a first step. The machine designs didn't change at first. One motor still drove the belts and pickoff gears to the spindle, cam movements, axial and transverse feeds.

At the last Machine Tool Show in Chicago, the Press pointed out that some of the new machines had several motors, each doing a separate job. The internal belting and pickoff gears had disappeared.

The machine tools of the future will have another refinement. Each of these several independent motors will have *infinitely variable speed*.

Because the Bryant Chucking Grinder Company of Springfield, Vermont believes in advance designing, they offer the Model No. 107 Chucking Grinder for finishing small holes. This machine is equipped with variable speed motor drives on the work spindle, cross feed and grinding wheel traverse.

This is an example of how machine tool builders are anticipating the requirements of the metalworking industry.

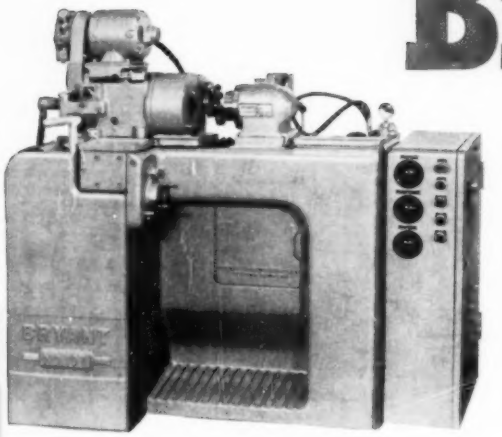
It won't cost to inquire.

Bryant Chucking Grinder Co. • Springfield, Vermont, U.S.A.

BRYANT

Number 107

INTERNAL GRINDERS



The No. 107, with Bryant Hi-Frequency Wheelhead, is the smallest internal grinder in the Bryant line. Other Bryant equipment will grind holes through the complete range up to 60-inch diameter swing. Write to the factory for full information.

SPECIFICATIONS

Total swing	9 inches
Will grind bore diameters	¼ to 3 inches
Maximum traverse	6 inches
Maximum hole depth	4 inches
Will grind included angle	90°
R.P.M. of work spindle	200 to 2,400 R.P.M.
Net weight	2,500 lbs.

Floor space — 60 inches x 50 inches (with coolant tank)

SLIDES
Preloaded ball slides for both cross and longitudinal motion.

WORKHEAD
Ball bearing spindle, variable speed electric drive, 200 to 2,400 R.P.M.

WHEELHEAD
Ball bearing, speeds up to 100,000 R.P.M.

TRAVERSE
Mechanical, powered by variable speed electric motor.

CROSS FEED
Powered by variable speed electric motor.

POWER
Standard A.C. current.

You can *"See the Difference"* with a BRYANT GAGE

NEW BRYANT 3-FLUTE TAP GAGE quickly determines lead, thread form and size of thread that tap will cut. Large dial indicator calibrated in "tenths." Can be used for inspecting 3-flute taps with or without radial relief and for threaded parts of the same diameter and pitch. Write for details.

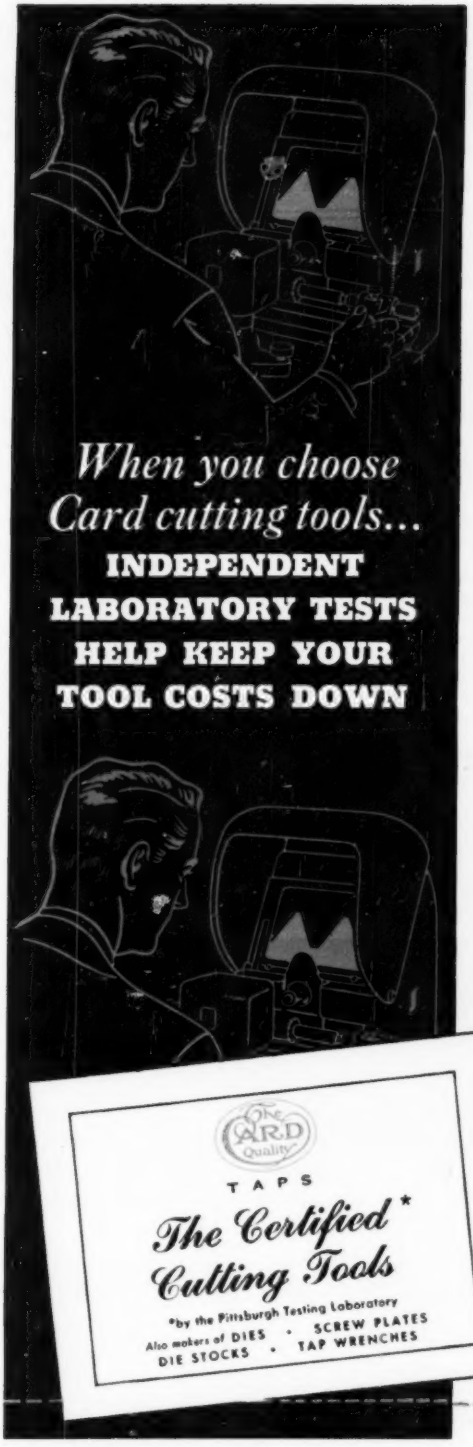
It is no longer necessary to "feel for fit" with plug and ring gages when inspecting threads. The Bryant Thread Gage shows, on a dial indicator, whether a thread will assemble properly with its component.

At a glance, anyone can compare threaded parts with a master and tell the whole story immediately — size, presence of burrs, out-of-roundness, accumulated inaccuracies of pitch, lead, diameter and thread form.

It's fast too. The design incorporates three thread segments, two stationary and one movable. The segments are operated by a thumb lever — the part is dropped between the segments — the lever is released, causing immediate contact of segments to threads — a one third turn of the part inspects it all over.

Send samples or drawings for a complete story on how Bryant can save inspection money for you.

Bryant Chucking Grinder Co. • Springfield, Vermont, U.S.A.



WHEN our tool inspectors put their "OK" on Card cutting tools we don't take their word for it!

Although we make Card tools meet the highest standards in factory inspection, we've engaged the famous Pittsburgh Testing Laboratory to make independent tests of our taps which they buy on the open market . . . just as you do. The results of their tests for hardness and dimensional accuracy are then *certified*.

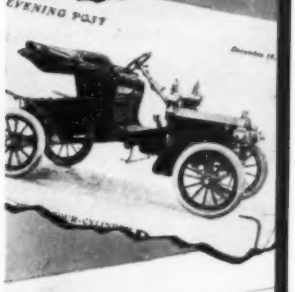
This means that when you invest in a Card tap, you've got that *extra assurance* of quality that means top performance on the job.

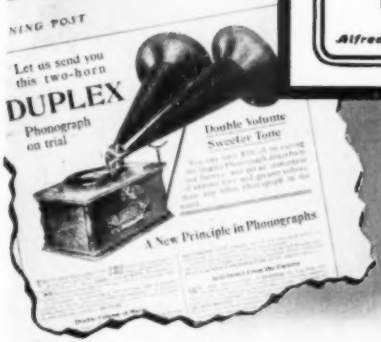
And for prompt service . . . your nearby Card Distributor is set up to fill your needs to perfection.

S. W. CARD

MANUFACTURING COMPANY
Mansfield, Massachusetts
DIVISION OF UNION TWIST DRILL CO.

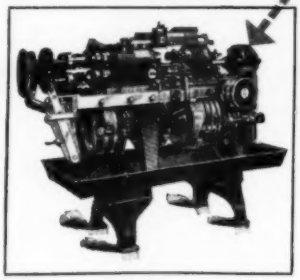
ARE YOU USING 1906 Machine





HITCHCOCK'S MACHINE TOOL LIST, JAN. 1906

"Acme Automatic"



The Wholesale Screw Machine

For quick, accurate work it has no equal. One set of tools only. **Four** bars simultaneously operated upon.

The National-Acme Mfg. Co.
Cleveland, Ohio, U. S. A.
Branch Offices: New York, Boston, Chicago
FOREIGN REPRESENTATIVES:
Alfred H. Schutte *Schuchardt & Schutte*

In 1906, the "Acme Automatic" was a sales leader—the first multipl machine to produce small duplicate parts good enough and fas enough to reduce unit costs on the volume-produced, nationally-adver tised products of the day—phonographs, washing machines, auto mobiles, "electrics", carriages and the like.

The old Acme Automatic is still a good machine—we find a occasional customer using one yet. *But it was not designed to produc today's parts, at today's costs for labor and materials.*

MODERN ACME-GRIDLEY AUTOMATICS are built in sizes:
Models RA-RB Bar Machine 9/16" to 5 1/8"—4, 6 and 8 Spindles.
Model RPA Chucking Machine 5 1/4" to 12"—4, 6 and 8 Spindles.

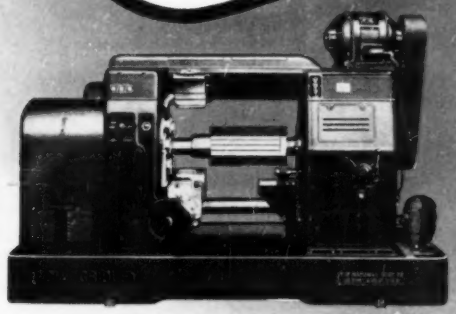
TO MAKE *1949 Models?*

To produce 1949 models—and make a profit—you can't get by with 1906 methods and machines—or even those of 1940!

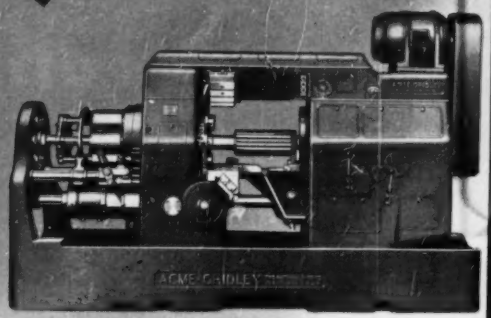
Any multiple spindle automatic that has not been continuously improved—improved in *strength*, in *precision*, in *adaptability*, in *output*—obsolete. Your competition is using equipment that will outproduce it, cut its production costs—and price you out of the market.

Forty thousand Acme-Gridley Bar and Chucking Automatics have a distinguished record over the years for lowering machining costs, to give you more good pieces in the pan at the end of each day. These time-proved records for production are no casual happenstance. They're based on a continuing policy of strict adherence to basic design requirements—ruggedness of frame, quick-change positive camming and, more recently, wider use of independent power-driven auxiliaries that eliminate many secondary operations.

Today's Acme-Gridley Automatics are built to give you *production*—as fast as modern tools will take it. With them you can meet *and beat* 1949 competition. We're prepared to quote them on the basis of guaranteed production figures. If your present machines are not postwar models it will pay you to make the comparison. May we help you?



Acme-Gridley Chuckers have a distinguished record for lowering production costs. Among their many moneysaving features is the wide, open tooling zone, permitting the use of independent power-driven auxiliaries that often eliminate secondary operations. Ask for bulletin CM43.



Acme-Gridley Bar Machines are known for their speed, stamina and adaptability. Rugged box-type frame, plus positive, close-coupled, quick-change camming provide a combination built for *speed*—as fast as modern tools will take. Ask for bulletin M45.

The NATIONAL ACME CO.

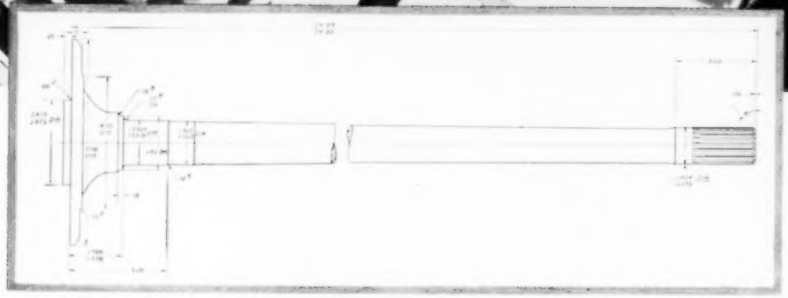
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

LODGE & SHIPLEY DUOMATIC LATHES at work...

...TURNING THE SHAFT at both ends!

11 TOOLS COMPLETE SLENDER AUTO AXLE IN 1.05 MINUTES



ELIMINATING the need for chucking and re-chucking, this tooling set-up machines both ends of a rear axle shaft for a well known automobile. Supplementing the Duomatic's standard front and rear tool carriages, an extra carriage has been added on the front at the tailstock end to turn the spline diameter on the shaft.

Simultaneously, tools on the other carriages are turning the bearing diameter, facing, chamfering and turning the flange and forming the rear diameter of the shaft. Both cemented carbide and high speed steel tools are used since the workpiece speed of 215 RPM produces cutting speeds of 394 as well as 78 feet per minute.

Note the air operated snubber which supports the center of this long, thin workpiece without requiring a machined steady rest spot.

This job is another of many examples of the way Lodge & Shipley Engineers add to the versatility and productivity of 2-A and 3-A Duomatic (automatic) Lathes. If you have part runs of 50 . . . 500 . . . or 5000 pieces, you can profit by putting your machining jobs on the Duomatic. Catalogs 635 (2-A Duomatic for smaller jobs) and 634 (3-A Duomatic for larger jobs) give complete details. Write for your copies today.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

For split-second drilling on all your jobs... get

SKIL Drills!

CUT COSTS WITH SKIL Tools

For top production . . . at lowest costs . . . get SKIL Tools! They're packed with fast-working power . . . built with long-lasting stamina. Ask your Distributor to demonstrate SKIL Tools today!

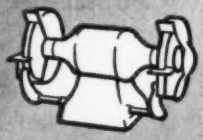
SKIL Drills

A size and type for every job from lightest production drilling to heaviest boring, reaming and hole-cutting. 33 powerful models.

SKIL Belt Sanders

Speed all surfacing on flat surfaces of wood, steel and compositions. Belt widths from 2¼ to 4½ inches. 4 powerful models.

SKIL Bench Grinders



Completely new line of powerful, fast-working grinders to boost production grinding, sharpening, wire-brushing and buffing. 4 models.

Whatever the material . . . whatever the job . . . SKIL Drills are the perfect answer to all drilling problems. They drive bits fast and clean through wood, steel or compositions. They put down more holes per hour on production, installation, repair and maintenance work. And SKIL Drills save you time and money at every turn.

SKIL Drills are light, compact, perfectly balanced. They handle easily even in the tightest corners . . . and stand up longer under the roughest use.

Call your SKIL Tool Distributor for a demonstration. Get SKIL Drill today!

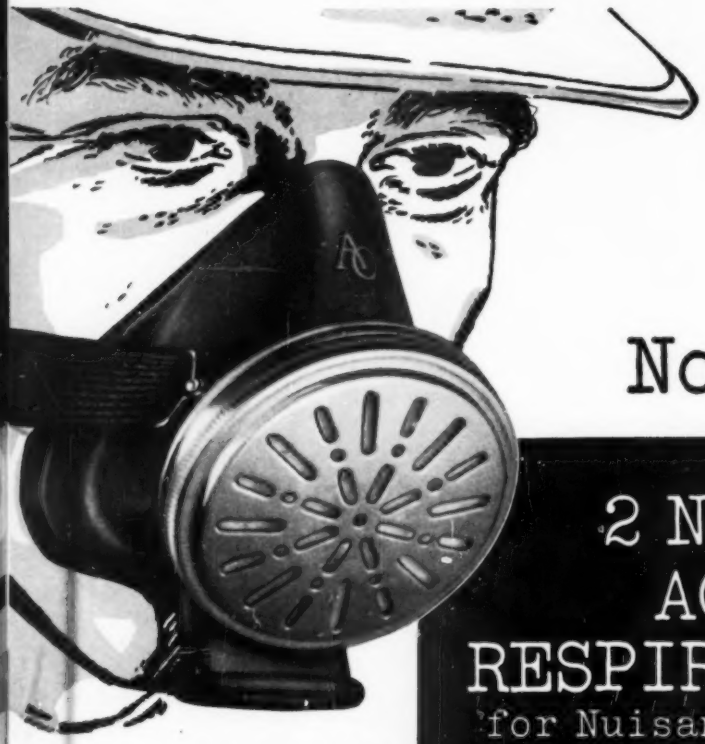
SKIL Tools

TRADE-MARK

SKILSAW, INC.
5033 Elston Ave.
Chicago 30, Ill.

Factory Branches in Principal Cities

In Canada:
SKILTOOLS, LTD.
24 Portland St., Toronto, Ont.



Now...

2 New AO RESPIRATORS for Nuisance Dusts

R 2900 R 2900A

Comfortable
Positive-Acting
Popularly-Priced

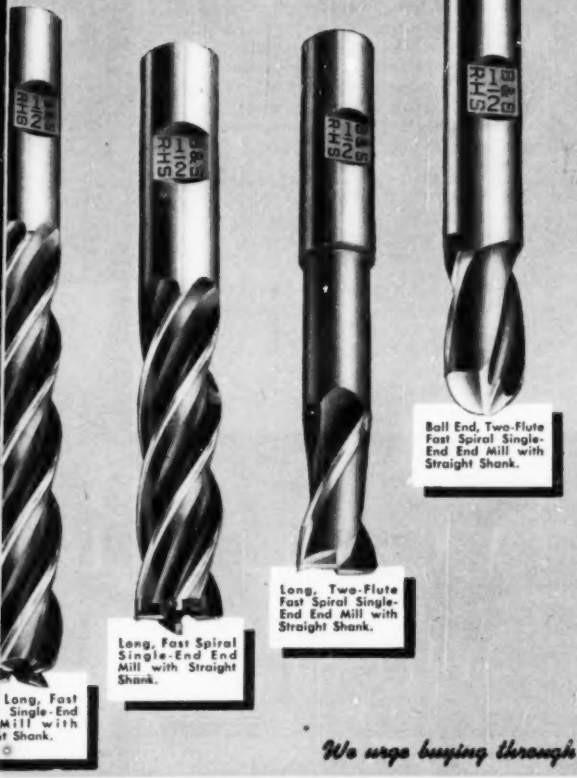
ire are two NEW respirators — the AO R-2900 l AO R-2900A that fill a definite need in applica- ns such as coal yards, grain elevators, cement ls, woodworking plants and some grinding oper- ns — wherever a *sound*, *serviceable* and *econom-* respirator is required for combating light con- trations of nuisance dusts. (For protection inst pneumoconiosis, silicosis and asbestosis t hazards, the new, revolutionary R-2000 Res- tor is recommended.)

h the R-2900 and R-2900A are similar in stream- d design to the R-2000. Vision is unobstructed h front and side . . . filter is lightweight and PLACEABLE . . . retainer cup light and dur- e. Any face may be fitted comfortably without adjustment and due to the lack of overall respirator weight, workers report no discomfort even when wearing the respirators for long periods. Inhalation and exhalation valves of the R-2900 (the R-2900A has no inhalation valve but is otherwise identical) prevent infiltration of dust while providing easy breathing action. The face masks of both respirators are of highest quality rubber with edges smoothly rounded for POSITIVE SEAL, no tools are necessary for disassembly and the respirators are quickly, easily cleaned. Ask your nearest AO Safety Representative about the complete line of AO dust protection equipment.

American Optical COMPANY *Safety Division*

Southbridge, Massachusetts • Offices in Principal Cities

For More Accurate Selection of Quality End Mills BROWN & SHARPE OFFERS 8 ADDITIONAL TYPES

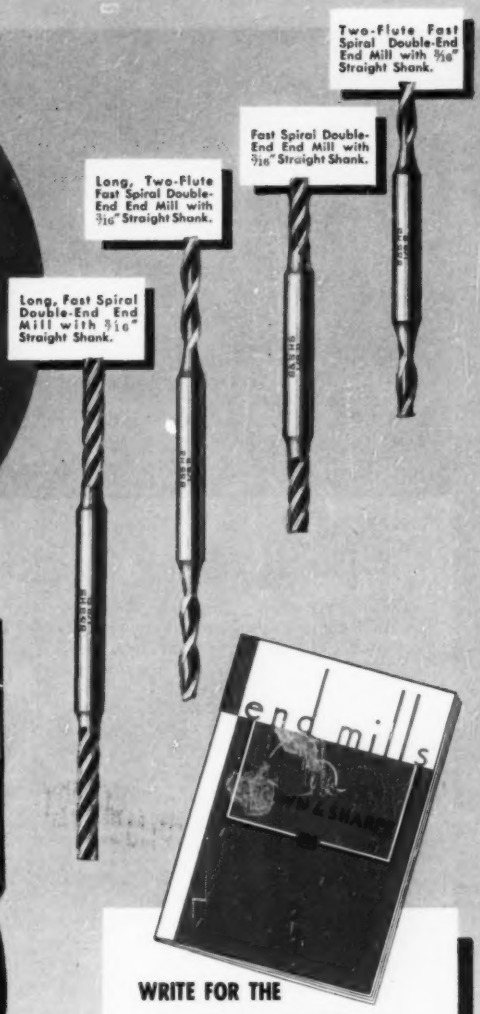


Long, Fast Single-End Mill with Straight Shank.

Long, Fast Spiral Single-End End Mill with Straight Shank.

Long, Two-Flute Fast Spiral Single-End End Mill with Straight Shank.

Ball End, Two-Flute Fast Spiral Single-End End Mill with Straight Shank.



Long, Fast Spiral Double-End End Mill with 3/16" Straight Shank.

Long, Two-Flute Fast Spiral Double-End End Mill with 3/16" Straight Shank.

Fast Spiral Double-End End Mill with 3/16" Straight Shank.

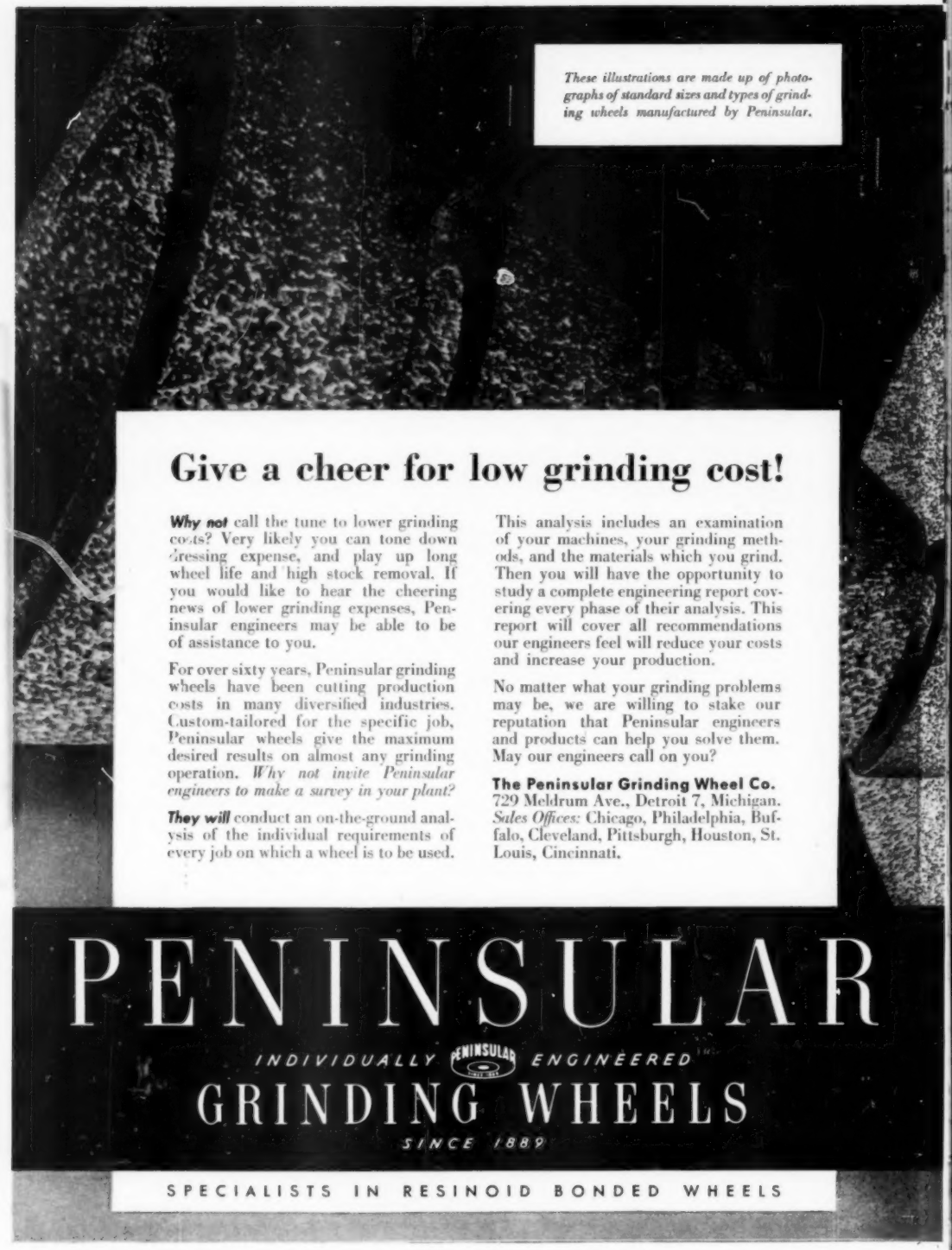
Two-Flute Fast Spiral Double-End End Mill with 3/16" Straight Shank.

WRITE FOR THE NEW HANDY-SIZE CATALOG

describing important production-improving features of all Brown & Sharpe End Mills together with complete specifications and prices. There's a Brown & Sharpe quality end mill to meet every end milling need. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

BROWN & SHARPE CUTTERS B·S



These illustrations are made up of photographs of standard sizes and types of grinding wheels manufactured by Peninsular.

Give a cheer for low grinding cost!

Why not call the tune to lower grinding costs? Very likely you can tone down dressing expense, and play up long wheel life and high stock removal. If you would like to hear the cheering news of lower grinding expenses, Peninsular engineers may be able to be of assistance to you.

For over sixty years, Peninsular grinding wheels have been cutting production costs in many diversified industries. Custom-tailored for the specific job, Peninsular wheels give the maximum desired results on almost any grinding operation. *Why not invite Peninsular engineers to make a survey in your plant?*

They will conduct an on-the-ground analysis of the individual requirements of every job on which a wheel is to be used. This analysis includes an examination of your machines, your grinding methods, and the materials which you grind. Then you will have the opportunity to study a complete engineering report covering every phase of their analysis. This report will cover all recommendations our engineers feel will reduce your costs and increase your production.

No matter what your grinding problems may be, we are willing to stake our reputation that Peninsular engineers and products can help you solve them. May our engineers call on you?

The Peninsular Grinding Wheel Co.
729 Meldrum Ave., Detroit 7, Michigan.
Sales Offices: Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

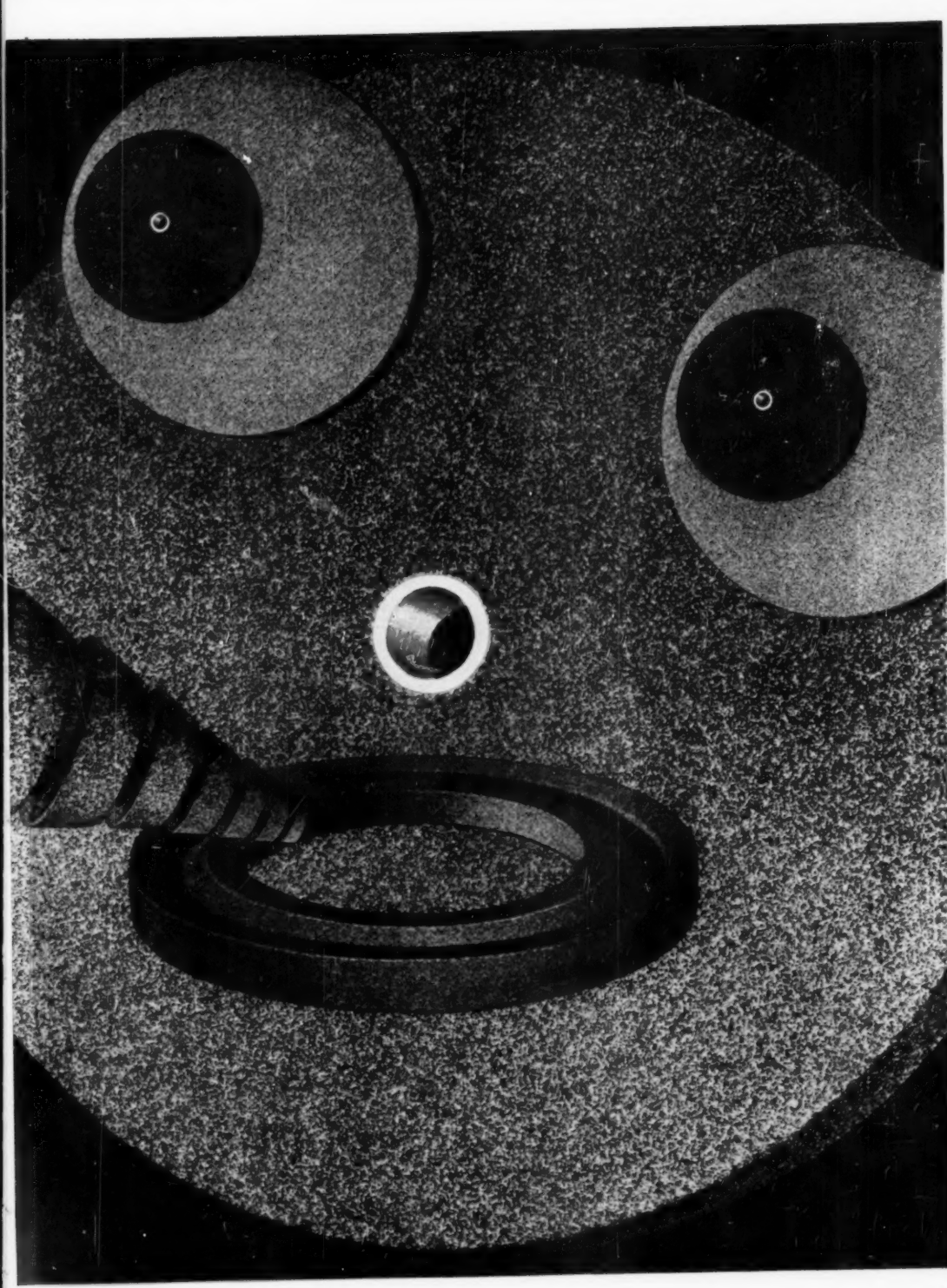
PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



MARVEL *Metal Cutting* SAWS

Better Machines–Better Blades

Regardless what type hack saw machines and metal-cutting band saw machines you use, **MARVEL BLADES** will improve performance. There are sound reasons why this is true; practical reasons that are easily understood and demonstrated.

MARVEL *High-Speed-Edge Hack Saw* Blades, with a genuine high-speed-steel cutting edge integrally welded to a tough alloy steel body, are both fast-cutting and *positively unbreakable*. This construction permits greatly increased speeds and feeds and tauter blade tensioning. Still, they last much longer than ordinary blades.

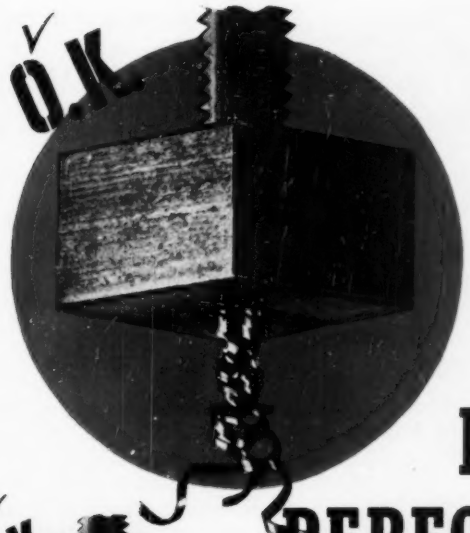
MARVEL *High-Speed-Edge Hole Saws*, with this same unbreakable construction and heavy-duty arbors, have the extra strength required for drill press and lathe use . . . rapidly saw holes from ⅜" to 4½" diameter thru steel of up to 1⅛" thickness.

MARVEL *Band Saws* are of selected quality. They come ready for use, pre-welded to size for each make and model saw. Individually boxed, they are protected against kinking, rusting or damage to teeth!

Write for Blade Catalog Sheet.

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVE. • CHICAGO 39, U. S. A.



Only 100% inspection insures PERFECT PERFORMANCE

ONLY when cutting tools have been given 100% inspection can you be *sure* of their top performance on the job. That's why every Butterfield spiral pointed tap is thoroughly checked so that it comes to you ready for your toughest assignments. Spiral pointed taps are designed for tapping deep through holes or blind holes drilled deeply enough to allow chip clearance at the bottom of the hole. They cut freely . . . produce excellent threads.

You can get quick deliveries of spiral pointed taps and other cutting tools from your nearby Butterfield Distributor ...he'll be glad to help you select the right tool for the job. BUTTERFIELD DIVISION, Union Twist Drill Company, Derby Line, Vermont, and Rock Island, Quebec.

Checking Pitch Diameter, Thread Form and Lead on a Zeiss Universal Measuring Microscope

BUTTERFIELD

THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES

FEDERAL PRESSES Withstand THE TEST OF TIME

Year after year, Federal Presses are meeting the challenge of volume production—at the same time fulfilling the rigid requirements of industry for accuracy and dependability. Federals have gained an enviable reputation for efficient performance—increasing production, giving faster, safer operation with minimum "down" time. Available in a wide range of sizes—6.6 tons to 79 tons—custom-engineered for long, trouble-free service. A Federal may help solve your own specialized problem. Write today for catalog showing the complete Federal line.

The Federal Press Co., 491 Div. St., Elkhart, Ind., Ph. 2831

check these features

RAMS—Symmetrical, giving equal distribution of weight and balance. Lock screws concealed in the ball nut eliminate necessity of refitting when adjustments are made to take up wear. **GIBS and V-WAYS**—For increased accuracy, speed, and to lessen possibility of "wobble", gibs and V-Ways are one-third longer than usual. No sacrifice in shut height. Surfaces carefully hand scraped. **CRANKSHAFTS**—Generously oversize, forged from high carbon steel, turned and ground to exacting specifications. "Plus-factor" of strength guarantees efficiency during life of press. **BRAKE and BEARINGS**—Spring tension type, allowing for heat expansion. Fitted with special linings. Main crankshaft bearings are honed to exact size. Bearing caps are split vertically and rest on reinforced frame. Shock from thrust and return stroke is transmitted directly to frame.

FRONT RECLINE—All Federal Presses have front-operated recline. One man can adjust. Lock bolts hold press in desired position. No creeping.

NON-REPEAT CLUTCH—Exclusive Federal safety feature. Easily engaged or disengaged—mere trip of the finger prevents repeating.

KNOCKOUT BRACKET—Hazard of misalignment due to knockout bar impact overcome—anchored to frame. Great saving in adjustment time.

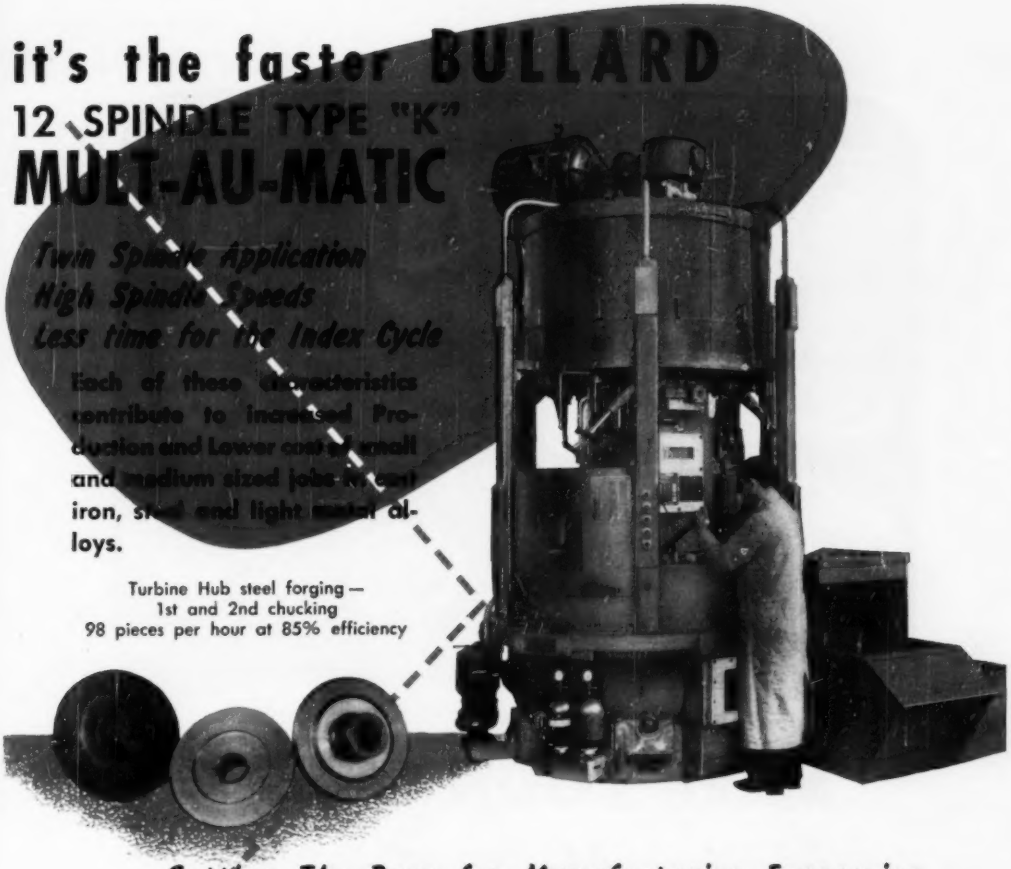
FEDERAL *Open back Inclinable* **PRESSES**

BUILT FOR SERVICE

it's the faster BULLARD
12 SPINDLE TYPE "K"
MULT-AU-MATIC

Twin Spindle Application
High Spindle Speeds
Less time for the Index Cycle

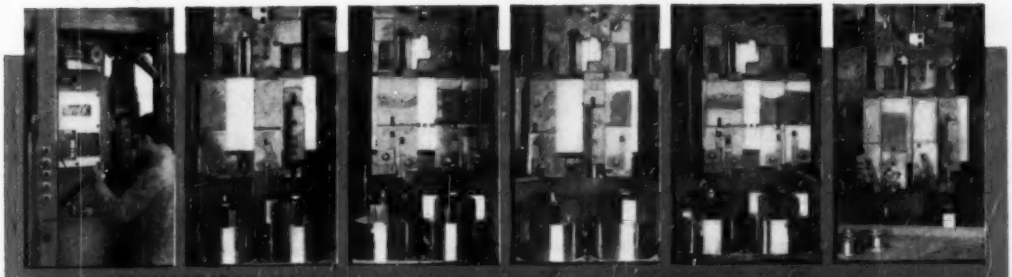
Each of these characteristics contribute to increased Production and Lower cost on small and medium sized jobs in cast iron, steel and light metal alloys.



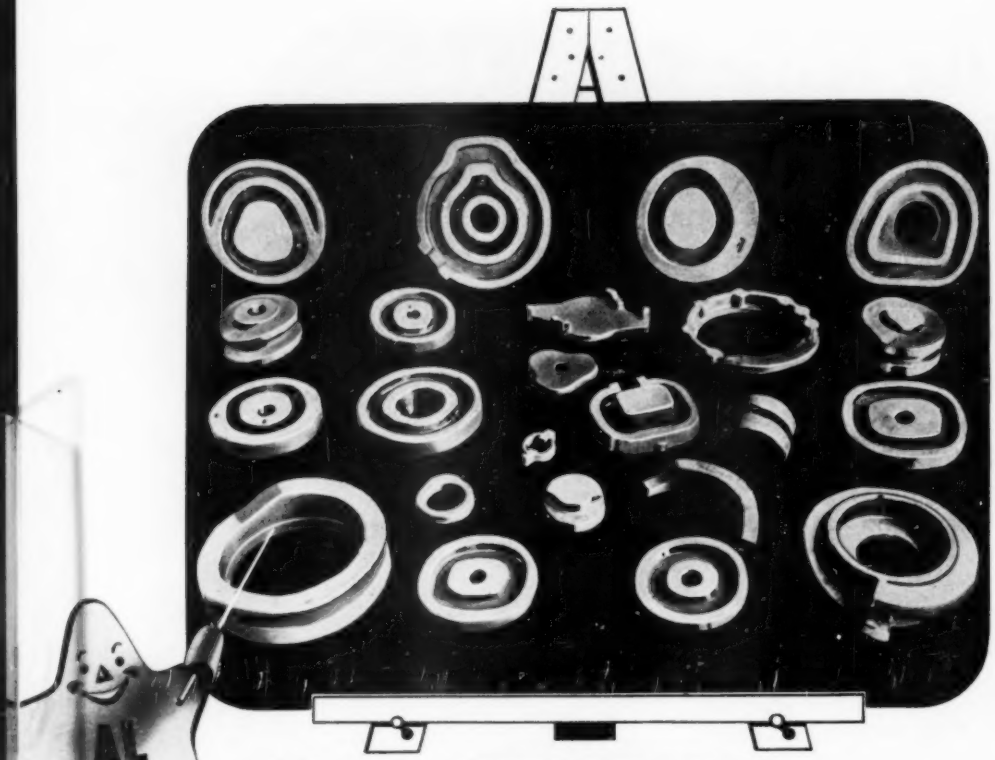
Turbine Hub steel forging—
1st and 2nd chucking
98 pieces per hour at 85% efficiency

Setting The Pace for Manufacturing Economies

There are 19 operations combined in the 1st and 2nd chuckings. Each index of the machine delivers a finished piece. When writing for information refer to ad XK



THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT



Make YOUR Cams this *Modern Money-Saving* way

Investigate FCC Cast to Shape Air Hardening Steel Cams for These Machines:

Bookbinding, Boot and Shoe, Bottling, Box Making, Breaking and Crushing, Brick and Tile, Can Making, Candy, Canning, Carpet Weaving, Cigarette and Cigar, Creamery and Dairy, Dredging and Excavating, Electrical, Envelope, Farm, Hoisting, Knitting, Laundry, Mining, Packaging, Paper Mill, Printing, Rubber Working, Rug Weaving, Screw, Textile, Vending, Washing, Woodworking, Wrapping.

IT WILL pay you to look into this method if you build or operate machines that use cams. Cast to shape from FCC Air Hardening Steel, your cams reach you with only an eighth-inch to be machined off, even from very intricate shapes. Of course this means big savings of time and material.

FCC Air Hardening Steel has great resistance to abrasion and an extremely high compressive strength. It machines readily and is easy to harden in air with unusual freedom from distortion and cracking. Cams made from it give remarkably long wear.

Full information on this money-saving product is available in a new booklet. Write for your copy of FCC "Cast-to-Shape Tool Steel", or send your specifications for estimates today. Prompt delivery.

ADDRESS DEPT. AM-81

ALLEGHENY LUDLUM STEEL CORPORATION
Pittsburgh, Pa.

Forging and Casting Division

DETROIT 20, MICHIGAN

WAD 1697

3 IMPORTANT ADDITIONS
the Brown & Sharpe Line

GE INGENIOUS new devices permit
', simpler measuring of unusual-shaped
—or in inaccessible places—with com-
confidence in the accuracy of results.
r quality of craftsmanship and mate-
is typical of Brown & Sharpe in every
ct.

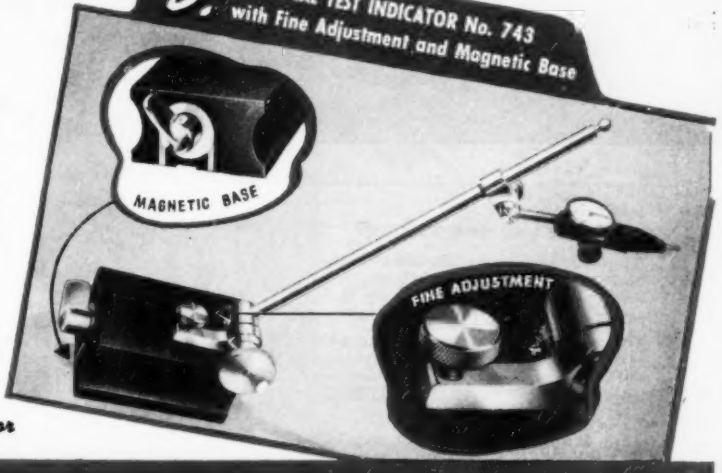
1. BALL ATTACHMENT No. 226 for Micrometer Calipers

1 This dual-utility attachment snaps on either anvil or spindle end of a micrometer caliper to facilitate measurement of curved sections. Hardened steel ball bears firmly against measuring surface. For all Brown & Sharpe micrometer calipers with conventional anvils and spindles except ½" and heavy types. Handy. Useful. Inexpensive.

CENTER AND SMALL HOLE ATTACHMENT SET No. 573 for Vernier Calipers

2 Center points of this attachment quickly convert a 6" or 150 mm vernier caliper into a direct reading divider that establishes center distances with precision. For locating holes to be drilled, establishing locating points in layout jobs, accurately measuring distance between two points or between a point and some locating part. Complete set includes two each; clamps, center points, small hole points.

3. DIAL TEST INDICATOR No. 743 with Fine Adjustment and Magnetic Base



3 The permanent magnet base of this
ce holds indicator firmly to any iron or
l surface . . . in upright, horizontal, or even
de-down position. Fine adjusting nut is
l to bring indicator point to exact setting
red. Indicator's light weight reduces tend-
/ to move. Magnet action produced by
ng of lever. For sale only in the United
es of America and its Territories.

eck all advantages of these new, fine tools.
ite Brown & Sharpe Mfg. Co., Providence
R. I., U. S. A.

urge buying through the Distributor

ROWN & SHARPE TOOLS BS

A new head with a good idea

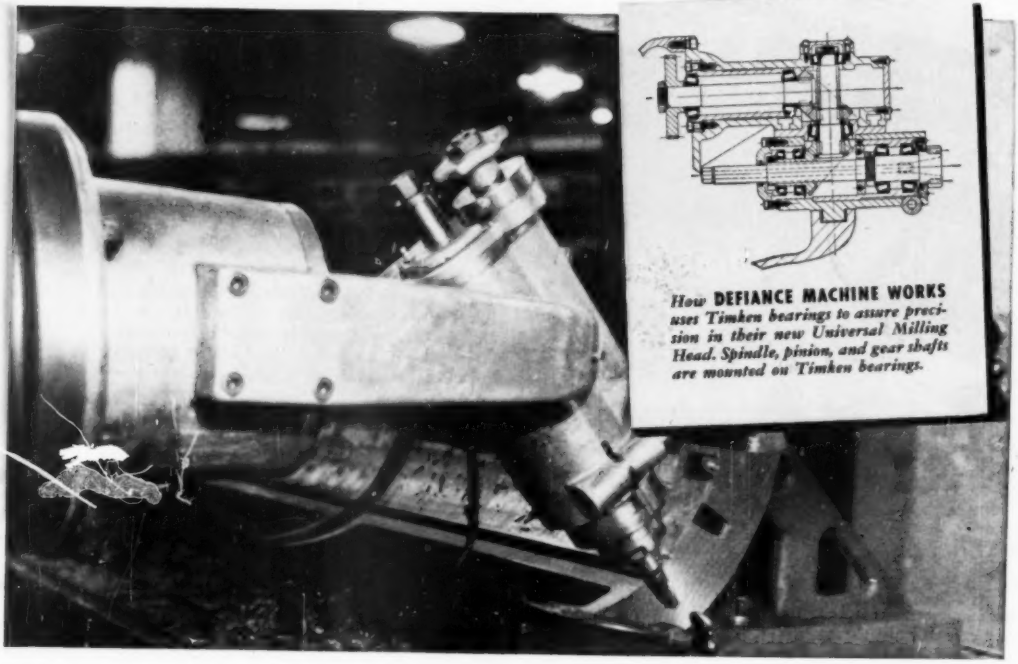
EQUIPPED with the new Defiance Universal Milling Head, a Defiance boring mill becomes a complete tool shop! The new head bores, drills, faces, and mills—at almost any angle. Rigidity, precision, and trouble-free operation are assured by the Timken® roller bearings on the spindle, pinion, and gear shafts.

Timken tapered roller bearings hold spindles rigid—keep them revolving accurately under the heaviest loads. Their tapered construction carries radial and thrust loads without deflection or end-movement and permits accurate preloading to any desired degree. Re-adjustment on the job is unnecessary due to "Generated Unit Assembly".

The rolls and races of Timken bearings are made of Timken fine alloy steel for toughness—then case hardened to give them wear-resisting surfaces. The line contact between rolls and races provides maximum load-carrying capacity.

Remember that Timken bearings in your product add a valuable sales feature. They build greater acceptance for your product among customers. So always look for the trade-mark "Timken" on the bearings you buy. And when buying new machinery, be sure it's Timken-equipped. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **DEFIANCE MACHINE WORKS** *uses Timken bearings to assure precision in their new Universal Milling Head. Spindle, pinion, and gear shafts are mounted on Timken bearings.*

GENERATED UNIT ASSEMBLY

An extra step in the manufacture of Timken bearings—after assembly—results in a natural and true geometric contact being generated between all rotating parts.

This perfect mating of the component parts—cone, rolls and cup—assures positive roll alignment, long lasting precision, permanent adjustment and smooth operation.

TIMKEN

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL AND THRUST ◫ LOADS OR ANY COMBINATION

fast

mobile

easy to operate

Dempster-Diggster

Has VICKERS HYDRAULIC CONTROLS

High speed versatility (as exemplified by the Dempster-Diggster) is characteristic of Vickers Hydraulic Controls.

Vickers Hydraulic Power Steering Booster makes it easier to steer the Dempster-Diggster over rough terrain, than a passenger car on smooth pavement. Steering load is carried by hydraulic cylinder . . . not by the driver.

Vickers Balanced Vane Type Pumps supply oil under pressure also for actuating cylinders that lift and crowd the dipper. These pumps are exceptionally efficient and dependable; their exclusive hydraulic balance construction prolongs pump life by entirely eliminating pressure-induced loads and consequent wear.

Overload protection for the machine is provided by relief valves integral with Vickers Steering Booster and Valves. Write for descriptive bulletins.

Vickers Improved Hydraulic Steering Booster with integral overload relief valve. See Bulletin 47-30a.

Vickers Balanced Vane Type Pumps are engine driven. See Bulletin 36-12.

Vickers "Multiple Unit" Valves include relief valve for overload protection. See Bulletin 40-13.

VICKERS Incorporated

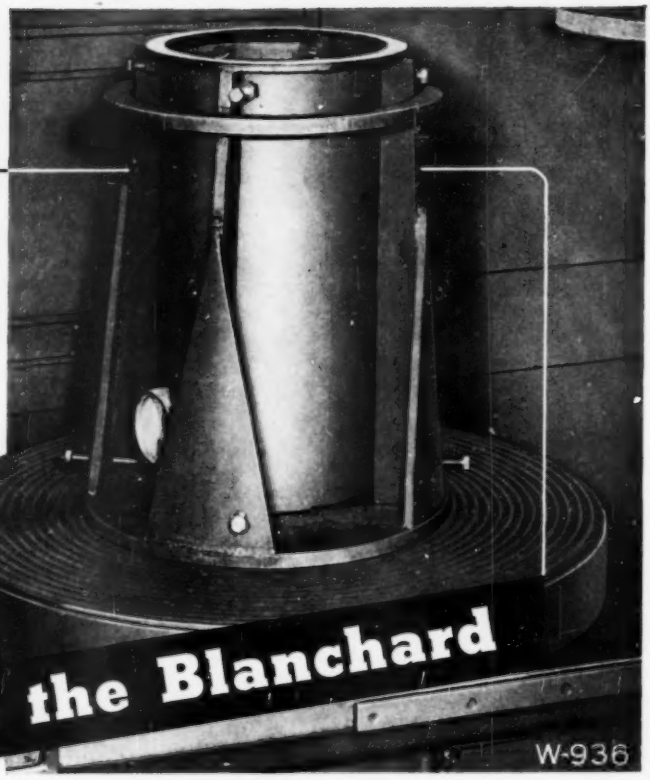
DIVISION OF THE SPERRY CORPORATION

1419 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices:

ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT
LOS ANGELES • NEWARK • PHILADELPHIA • PITTSBURGH • ROCHESTER
ROCKFORD • ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921



GRINDING THE FLANGE OF A HIGH THIN-SECTIONED TANK—

Put it on the Blanchard

W-936

Here's another profitable "Yes" answer to the question, "Can we put it on the Blanchard"? Supported in a typically inexpensive, Blanchard-designed fixture, this Filter Tank for Gasoline Purification is held on the 36-inch chuck of a No. 18 BLANCHARD SURFACE GRINDER.

The tank is of welded steel, one foot diameter and two feet high. Stock removal from the flange averages 1/16". The surface must be flat, with a good finish. Production is six pieces per hour.

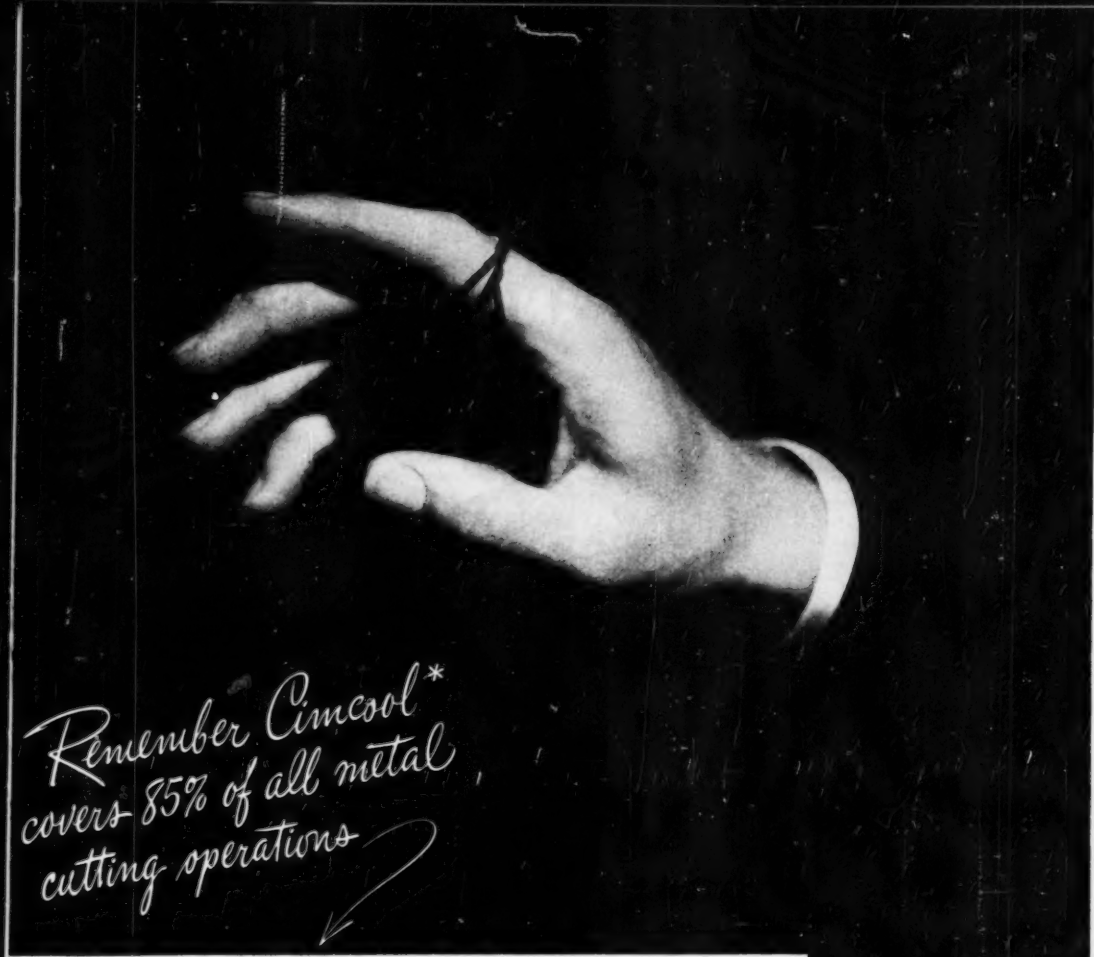
Let Blanchard grinding engineers assist you in solving *your* flat surface grinding problems. Send us your prints and data—also samples if possible. You'll quickly get reliable recommendations and production estimates. This service is free and places you under no obligation.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.



Remember Cimcool covers 85% of all metal cutting operations*

And you'll never be able to *forget*, once you see how Cimcool takes over 85% of all metal cutting operations and *does a better job.* This revolutionary cutting fluid replaces all water emulsions and all but a few highly compounded specialty oils. It proves itself by improving machine performance.

Cimcool is different—a *chemical emulsion*—that combines friction reduction and cooling capacity in a degree never before attained. You get longer tool life, less down time. Cimcool lasts longer in the machines too, reduces the cost of cleaning and changing. And Cimcool permits faster speeds.

Proof? Let a demonstration in one of your own machines convince you.

CIMCOOL DIVISION OF THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U.S.A.

* Mark Reg. U.S. Pat. Off.

get a finer, faster, truer

with MADISON boring tools

THERE'S A MADISON FOR EVERY BORING OPERATION

ROUGH BORING TOOL

This tool, in many cases, will remove as much stock in one pass as an ordinary single point tool in three passes . . . and at faster speeds.

FINISH BORING TOOL

A tool that works to close tolerances at high production speeds . . . yet still gives a superior, mirror-smooth finish.

COMBINATION BOREAMER

Combines the roughing and finishing tool in one bar . . . does the whole job in one pass of the tool. This definitely steps up production.

Write for the new Madison Catalog

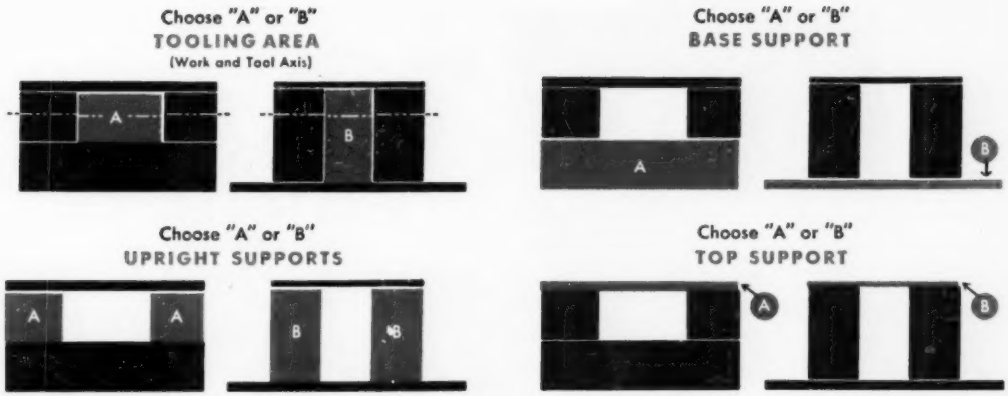
Madisons have won a reputation for lowering hole costs through speed, accuracy, and simplicity of operation. Recently a group of veteran tool men were asked this simple question, point blank, "Why Use Madison?" Their replies, as follows, indicate several sound and basic advantages in Madisons that can't miss cutting down costs in any operation.

1. **Superior finishes, in many cases equaled only by Grinding. Tolerances to .0003.**
2. More holes per cutter before regrinding.
3. More regrinds per cutter (about 10 times as many as similar tools).
4. Faster regrind.
5. Cutter may be floated in the bar — bar remains stationary. No special floating holders needed.

TAKES ONLY SECONDS TO CHANGE A MADISON CUTTER

A Madison cutter may be quickly removed from the bar and set to a different diameter, or replaced by a sharpened cutter. Merely loosen screws "A" and "B", slip out old cutter, put in new cutter, tighten screws. Work is not disturbed.

MADISON MANUFACTURING COMPANY
DEPT. AM MUSKEGON, MICHIGAN



HOW GOOD ARE YOU ON MACHINE DESIGN?

The all-round efficient service given by any machine tool, and the opportunity for its improvement and development, usually depend on advantages afforded by its basic design. Before purchasing a machine it will pay to look for the advantages or disadvantages of its basic design.

	MACHINE #1*	MACHINE #2	MACHINE #3	MACHINE #4	MACHINE #5
WORK & TOOL CAPACITY	✓				
WORK & TOOL SUPPORT	✓				
WORK & TOOL MAINTENANCE	✓				

*CONOMATIC

Any good investment has certain qualifications that prove it profitable. The wise investor and smart banker have some sort of measuring stick to analyze every investment they make.

Why not use a measuring stick to chart your purchases of Automatic Bar Machines? If you are already using a chart, perhaps you would like to compare it with the one that we have prepared. Write to us for a copy or ask the Cone representative.

Above are illustrated two types of frame design of Multiple Spindle Automatic Bar Machines. Assuming that the Tooling Area is important — and is as efficient as the frame around it permits — which of the two designs would you choose to meet the following requirements?

WORK & TOOL CAPACITY

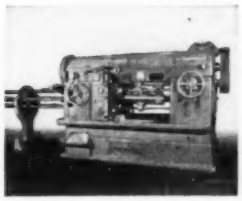
Long, open, roomy Tooling Area and long main end slide for handling longer work and for clearing die heads in threading, etc., to the full collet capacity of the machine; for heavy cross-slide cuts, deep hole drilling, and general all-round work with HSS or Carbide Tools.

WORK & TOOL SUPPORT

Genuine, horizontal, rectangular box-frame, free of overhang; heavy-set, rigid upright members for supporting head-stock and gear box units between heavy, full-length top and base members, for substantial support of all work and tools close to the work and tool axis, and for the maintenance of accurate alignment of work and tools.

WORK & TOOL MAINTENANCE

Heavy, strong, well supported, overhang-free, vibration-free, liberal bearing, convenient, adjustable, work holding units and tool slides, with accessible chip-free cams, with adequate capacity in base member for chip disposal and cutting coolant.



A comparison with ALL Automatics will lead you to

Conomatic

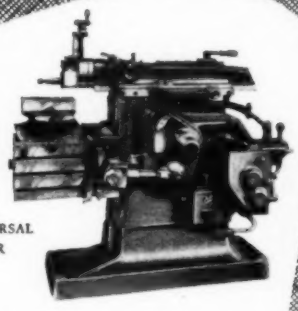
#1A.

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

A KNOTTY PROBLEM?

. . . not when you have a Hendey 12" Universal Hi-Sp Shaper in the plant! This unusually versatile shaper machined ordinary hex bar into the multi-facet form, above, *in a single setti of the work in the vise.* You may not wish to cut such shapes, bu you do want to eliminate expensive set-up time. With a table tha can tilt to any angle, the Hendey 12" Shaper reduces set-up time to a minimum. Add to this its ability to remove metal faster and more accurately and you have a perfect combination of cost-saving features that are worth investigating.

Have you any knotty shaping problems? . . . Better write for full details on the Hendey 12" Hi-Speed Shaper today.



HENDEY 12" UNIVERSAL
HI-SPEED SHAPER

Other Hendey Machines Include
Tool Room Lathes — 9"- 12"- 14"- 16"- 18"- 20"- 24"
Shapers — 12"- 16"- 20"- 24"- 28"

THE *hendey* MACHINE COMPANY

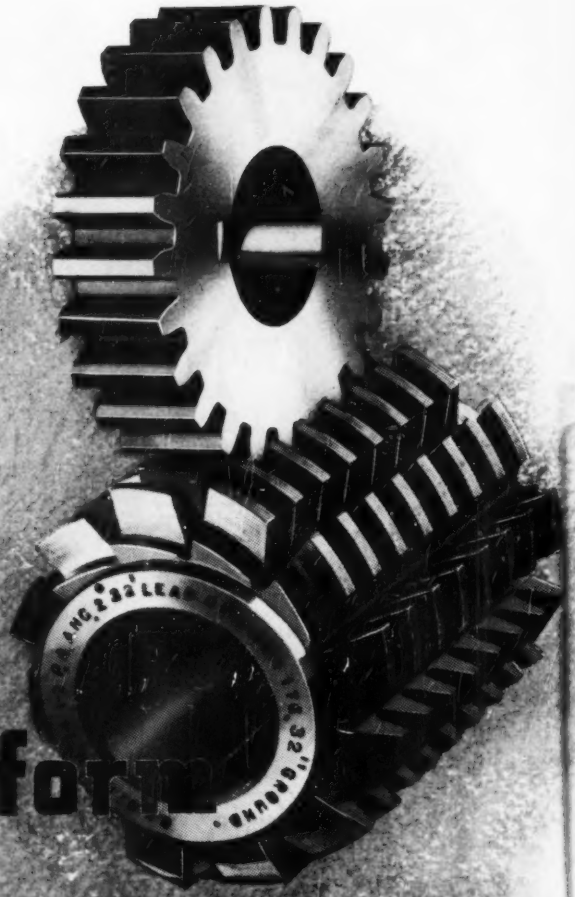
MAIN OFFICE & PLANT: TORRINGTON, CONN.

BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh

hendey

no other hob will outperform a UNION



See Catalog R
for various types of hobs

contact your local distributor

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

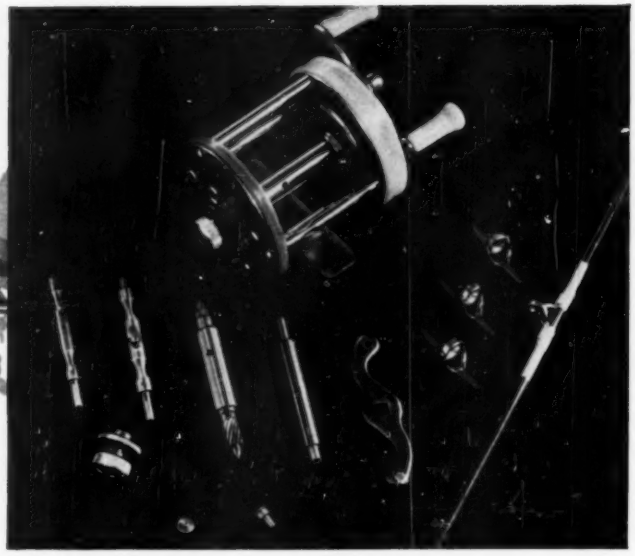
MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.

BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

Free-Machining
ENDURO STAINLESS STEEL



...Selected for Reel Quality—Plus Economy

Corrosion-resistance is a primary requirement in any fishing reel. So, too, is precision machining for smooth, dependable operating characteristics. That's why many reel manufacturers use ENDURO Stainless Steel.

ENDURO Cold Finished Bars are processed by Republic's Union Drawn Steel Division with an eye toward efficient, economical production. *Close tolerances, accuracy of section, UNIFORM MACHINABILITY, uniform soundness and fine surface finish* combine to keep unit costs and reject losses to welcome low figures.

Whatever *your* product requirements—eye appeal, corrosion-resistance, ease of cleaning, sanitation or extra long life—remember that you can get *PROMPT DELIVERY* of ENDURO Stainless Steel Bars—cold finished or hot rolled—and wire. Write us *today.*

A VALUABLE AID FOR MACHINISTS

It's a handy Speed and Feed Selector to help you in machining stainless steel. Send for one TODAY.. it's FREE.

REPUBLIC STEEL CORPORATION
ADV. DIVISION • DEPT. AM
3100 East 45th Street
Cleveland 4, Ohio

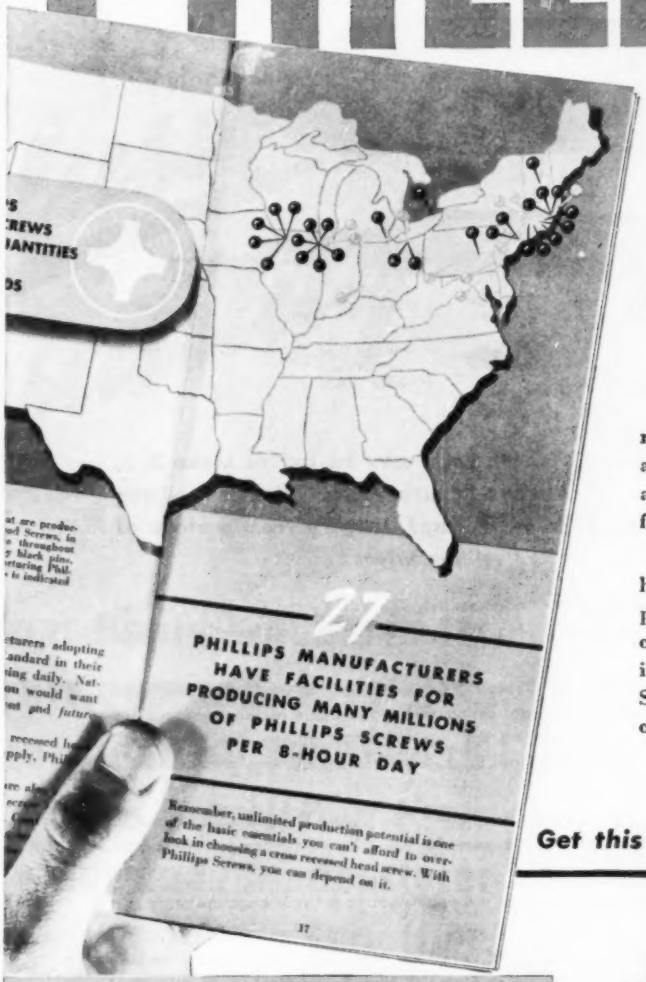
Republic ENDURO FREE-MACHINING STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

ONLY PHILLIPS RECESSED HEAD SCREWS

are available from MULTIPLE sources of supply

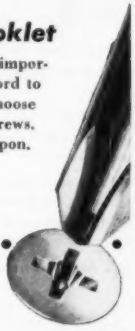

27
PHILLIPS MANUFACTURERS HAVE FACILITIES FOR PRODUCING MANY MILLIONS OF PHILLIPS SCREWS PER 8-HOUR DAY
Remember, unlimited production potential is one of the basic essentials you can't afford to overlook in choosing a cross recessed head screw. With Phillips Screws, you can depend on it.

With the cross recessed head screw rapidly becoming the preferred screw for all types of industrial assemblies, it is all-important to be sure that present and future needs can be supplied.

Since Phillips is the only cross recessed head screw with *multiple* sources of supply, Phillips Screws are your logical choice. And this is just one of the five important reasons why *only* Phillips Screws give you *all* the advantages of the cross recess design.

Get this new Fact-Full Booklet

that lets you in on the important facts you can't afford to overlook when you choose cross recessed head screws. It's FREE. Use the coupon.



GET ALL THE ADVANTAGES OF ASSEMBLY WITH CROSS RECESSED HEAD SCREWS . . .

GET PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

27 SOURCES

American Screw Co.
Camcar Products Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
Camson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Rockford Screw Products Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Seaboard Screw Corp.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wales-Beech Corp.
Wolverine Bolt Company

Phillips Screw Mfrs.,
c/o Horton-Noyes Co.
1800 Industrial Trust Bldg.
Providence, R. I.

Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

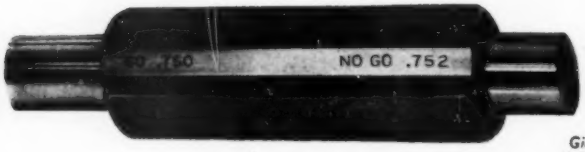
Name _____

Company _____

Address _____

AM37

Van Keuren WIRE TYPE PLUG GAGES



Giant's Grip
0.500"-1.000"

Safety Bushing
.020"-0.500"

Wafer Type
1/30th oz.
0.002"-0.020"

TOOL STEEL
•
HIGH SPEED STEEL
•
CHROMIUM PLATE
•
VK CARBOLOY

Full 1⅞" and 2" length units may be cut to make 2, 3, or 4 gages . . . Always accurate. No rejections. Long life aluminum handles. *Prompt delivery from a stock of 2 million wires.*

Wire type plug gages were originated by The Van Keuren Co. in 1925. They have resulted in gigantic savings for American Industry and have been widely imitated.

Only in Van Keuren Wire Type Plug Gages is the maximum value of your gage dollar fully realized. The light aluminum handles are especially designed for utility, holding power and long life. The full length gaging units have a uniform high hardness, exceptional finish, long wearing qualities and superlative accuracy.

You do not need to inspect Van Keuren Plug Gages. Our double inspection at the factory takes care of that expense for you. There is no time lost waiting for replacements.

Van Keuren prompt deliveries will enable you to cut your gage inventory to a minimum.

On your next order specify VK Wire Type Plug Gages. VK Carboloy for long runs or fussy jobs. VK Chromium Plate, VK High Speed Steel or VK Alloy Tool Steel for less exacting jobs. You will be assured of the best in accuracy, quality and delivery.

FOR SUPERSERVICE Phone Watertown 4-4394

his 208 page volume represents 2
s of research sponsored by the Van
ren Co.
presents for the first time in history
mple and exact method of measuring
ws and worms with wires.
tells how to measure gears, splines
involute serrations. It is an accepted
rence book for measuring problems
methods.
Copies now free upon request.

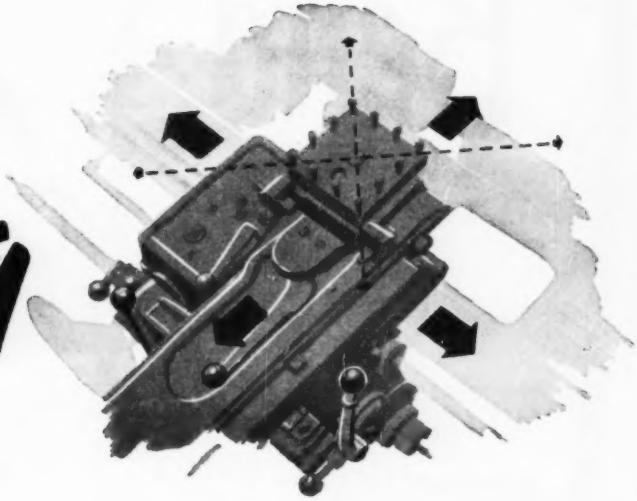
THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

30th YEAR

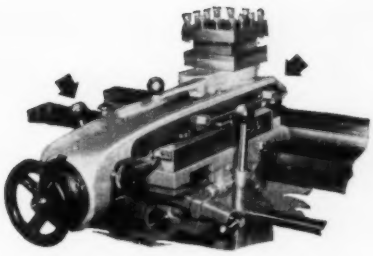
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

;HOLT Saddle Type TURRET LATHES

uclusive
ersatility



Power Rapid Traverses for
de carriage and cross slide
re controlled by dual levers,
thus permitting them
to move independently or
together.



Gisholt's more versatile power rapid traverse reduces time lag between cuts, speeds production, saves time and money. *This has been a standard Gisholt feature for over twenty years.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS BALANCERS • SPECIAL MACHINES

Bend it?

no, but you can
ECONOMICALLY and QUICKLY

ROUT · MILL
CUT · TAP
TURN · DRILL
SHAPE
with

DIE STOCK

another Masonite Brand Product

Masonite* Die Stock is rigidly strong, dimensionally stable and is easily processed in wood- or metal-working shop. This dense, durable material is easy to handle, weighs one-sixth as much as steel. Dies, jigs, fixtures, and other tools are quickly produced with Masonite Die Stock. Excellent for fabricating sheet metals—especially aluminum, copper, brass and silver. Will not scratch the surface of Alclad aluminum or silver. Won't shrink or twist. Comes in panels 48 x 72 and 48 x 144 inches — ¼ to 2 inches thick. Can be laminated to greater thickness with cold-setting adhesives. Cost is surprisingly low. Send coupon for details.

*"Masonite" is a trade-mark registered in the U. S. Pat. Off. and signifies that Masonite Corporation is the source of the product.

Mail this coupon TODAY for complete details

MASONITE CORPORATION, Dept. AM-1, 111 W. Washington St., Chicago 2, Ill.
Send me free, illustrated, information-packed "Masonite Die Stock Data Book."

Name _____

Firm and title _____

Address _____

City _____ Zone _____ State _____

production sharpening • precision sharpening

IT'S ALL THE SAME ON THE 6-5

The ease with which precision sharpening is accomplished on the No. 6-5 Hydraulic Hob Sharpening Machine, is demonstrated in this actual job record.

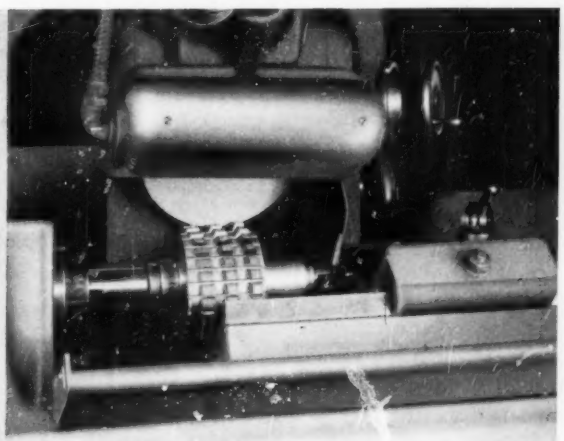
This application shows the accuracy obtained when sharpening large diameter, taper root spline hobs. These hobs are 5" in diameter, with decreased cutting depth from the large to the small end for hobbing a tapered root diameter on spline shafts, and are made with 26 teeth to produce excellent finish with a fine feed mark pattern.

When sharpening with ordinary methods, deflection of the wheel sometimes occurs as the wheel pressure against the teeth diminishes toward the shallow depth. This condition is eliminated on the No. 6-5 because of the rigidity built into the wheel head, and the precision control provided over indexing and table travel. Sharpening tolerances maintained on a complete lot of 20 hobs are shown.

Write for complete information on the 6-5 Machine. Ask for Bulletin 3212.

Barber-Colman Company

GENERAL OFFICES AND PLANT 213 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.



JOB FACTS

Operation — Face sharpen Taper Root High Speed Steel Spline Hobs to class AA tolerances

Hobs—5" diameter x 3-1/2" face	
Gashes—Straight	Cutting Faces—Radial
Depth of Grind—25/64"	Wheel—7" Carborundum
Stock Removed—.010"	Feed per Rev.—.0005"
Wheel RPM—3600	Coolant—Micro-Grind

Accuracy—Adjacent spacing—.0005"
Non-adjacent spacing—.001"
Radial faces—.0003"

BARBER COLMAN — EASIER, MORE ACCURATE HOB SHARPENING...

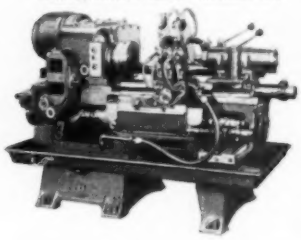
For *Greater* SPINDLE RIGIDITY

ON FAY LATHES!

Heavy-duty machines with **SKF** Spindle Bearings have greater spindle rigidity assuring faster, deeper and smoother cutting. The use of these bearings insures repetitive accuracy and uniformity of finished work; predominant radial and thrust loads are absorbed by separate bearings for maximum rigidity, and, because of the low friction torque of **SKF** Spindle Bearings, the spind can operate through a wi range of speeds without requiri bearing adjustment.

The *initial* cost of th **SK** Spindle Desig may a little more than otl designs, but, on the ba of performance, it's wo more.

Fay Automatic Lathe built by Jones & Lamson Machine Co.



Send for new 60-page Catalog No. 272-A

SKF INDUSTRIES, I
PHILADELPHIA 32, PENN

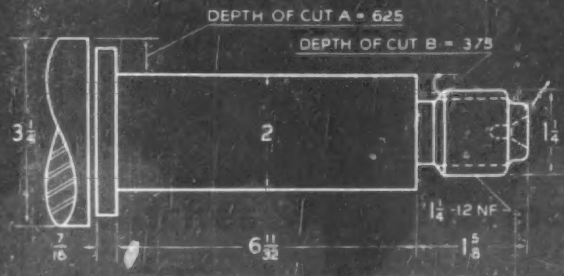
SKF

BALL & ROLLER BEARINGS

CAN YOU COMPETE AGAINST PRODUCTION LIKE THIS ?

ONLY 5.8 MINUTES

was required to make this Locomotive Valve Motion Pin from X-1315 Bar Stock with Carbide Tools.

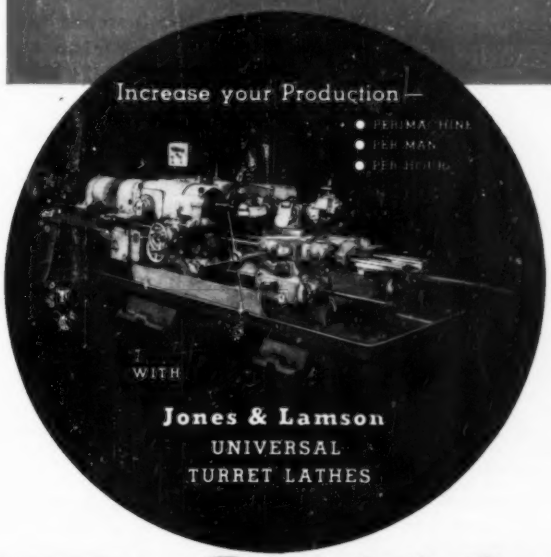


LOCOMOTIVE VALVE MOTION PIN
MATERIAL X-1315

Power Turning on a Jones & Lamson No. 7A-5 Turret Lathe. Cut "A" required 22 HP for each piece at 220 FPM, .022 feed. Cut "B" took 17 HP at 275 FPM, .022 feed. Production was doubled.

This is a typical example of what can be accomplished with a lathe designed, built and powered to obtain maximum production.

Write for Folder No. 486 describing this operation in detail, or better yet, ask for one of our engineers to study your lathe operations. His recommendations will reduce your costs.



DESIGNED to lower every turni cost.

BUILT for maximum production wi either carbide or high speed ste tools.

POWERED to produce more chips p tool, more pieces per hour, mo profit per job . . . than any turr lathe of comparable range.

Turret Lathe Division

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835

OHIO GEAR

DISTRIBUTORS AND REPRESENTATIVES

*Akron, Ohio
Hardware & Supply Co.
Buffalo, N. Y.
F. E. Allen
*Buffalo, N. Y.
S. H. Pooley Belting Co.
Chicago 7, Illinois
Schrade-Batterson Co.
*Dayton, Ohio
E. C. Hawk Co.
Detroit 26, Mich.
George P. Coulter
*Detroit 6, Michigan
Eynon-Dakin Co.
*Findlay, Ohio
Bearing & Transmission Co.
*Hagerstown, Md.
Hagerstown Equipment Co.
Indianapolis, Indiana
A. R. Young
*Los Angeles, Calif.
J.W. Minder Chain & Gear Co.
Louisville, Ky.
Alfred Halliday
Milwaukee, Wisconsin
R. W. Ballentine
*Minneapolis, Minn.
Industrial Supply Co.
*New York City 13, N. Y.
Patron Transmission Co. Inc.
*North Kansas City, Mo.
Sesco Engineering & Supply
Pawtucket, Rhode Island
George G. Pragst
*Philadelphia 6, Pa.
Robert L. Latimer Co.
*Philadelphia 6, Pa.
Rothman Belting & Equipment Co.
*Pittsburgh, Pa.
Standard Machinists Supply Co.
*Portland, Oregon
J. W. Minder Chain & Gear Co.
*Rochester 4, N. Y.
H. M. Cross and Sons
*San Francisco, Calif.
The Adam Hill Co.
*St. Louis, Mo.
The Easmueller Co.
*Syracuse, N. Y.
Uplinger and Sherman
Toledo, Ohio
The Bearing & Transmission Co.

IN CANADA

*Montreal, Quebec, Canada
John Braidwood & Sons, Ltd.

*Stocks Carried.

Nationally known Ohio Gears and Speed Reducers are nearer to you than ever before. Alert distributors, with comprehensive stocks offer the famous Ohio Gear "Off the Shelf Service" in nearly every industrial center across the continent.

No farther than your phone, you'll find Ohio Stock Gears in spur, helical, bevel, worm and worm wheel types and Speed Reducers in single and double reductions in 1/6 HP to 10 HP and in ratios from 3-1 to 3200-1. You'll also find sound, capable engineering service as well as prompt attention to your needs.

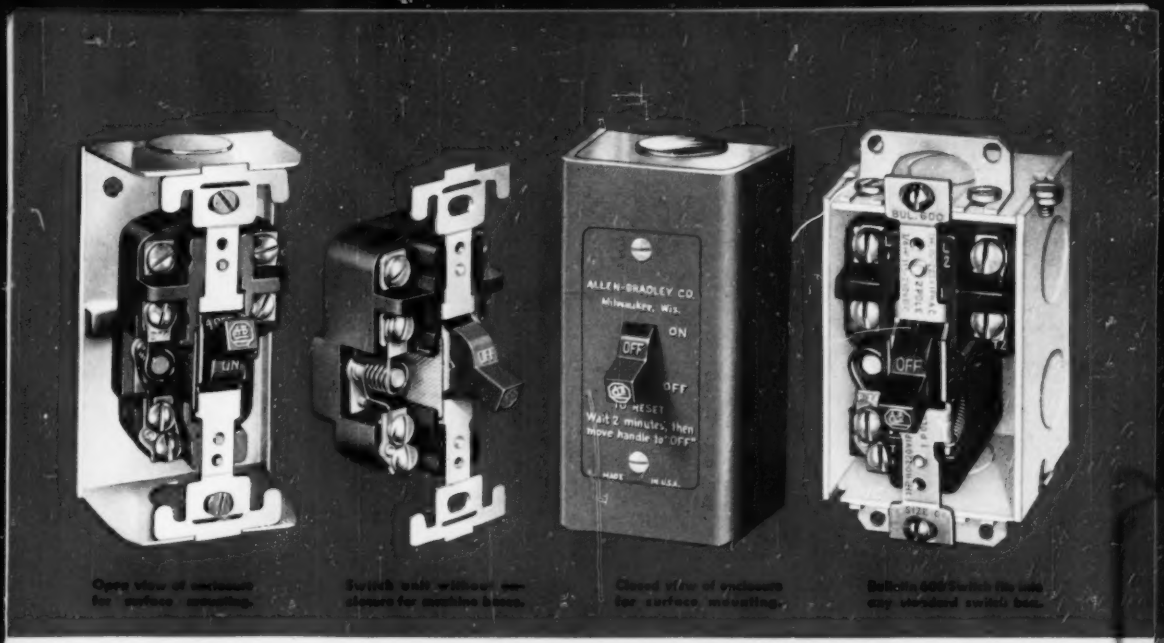
Put the money-saving advantages of Ohio Stock Gears and Reducers to work for you now. Phone the nearest distributor or write direct.

ESTABLISHED 1915

THE OHIO GEAR COMPANY

1326 EAST 179th STREET • CLEVELAND 10, OHIO

OHIO GEARS



Open view of enclosure for surface mounting.

Switch unit without enclosure for machine bases.

Closed view of enclosure for surface mounting.

Bulletin 600 Switch fits into any standard switch box.

Starting Switches with Overload Protection for Fractional Horsepower Motors

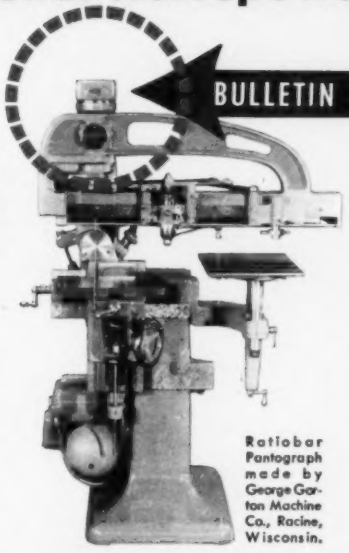
BULLETIN 600 STARTING SWITCH

To satisfy the latest ruling of the National Electrical Code... which requires overload protection for many fractional horsepower motor applications... the Bulletin 600 Starting Switch is the popular answer.

Its self-contained thermal breaker is always dependable. Long periods of inactivity will not affect its accuracy. At the first sustained overload... the switch trips... and the motor is protected against burnout.

Waterproof Enclosure.

The Bulletin 600 Starting Switch cannot be held closed until the overload condition is corrected. This compact control unit is a sales asset to any machine.



Ratiobar Pantograph made by George Gorton Machine Co., Racine, Wisconsin.

Above is shown how easily the Bulletin 600 Fractional Horsepower Starting Switch fits into the standard Allen-Bradley enclosure or into any standard switch box.

The switch unit can also be mounted in any suitable cavity in the machine frame.

For locations requiring enclosures to operate in wet or hazardous locations, there are several standard A-B enclosures to meet every service requirement.

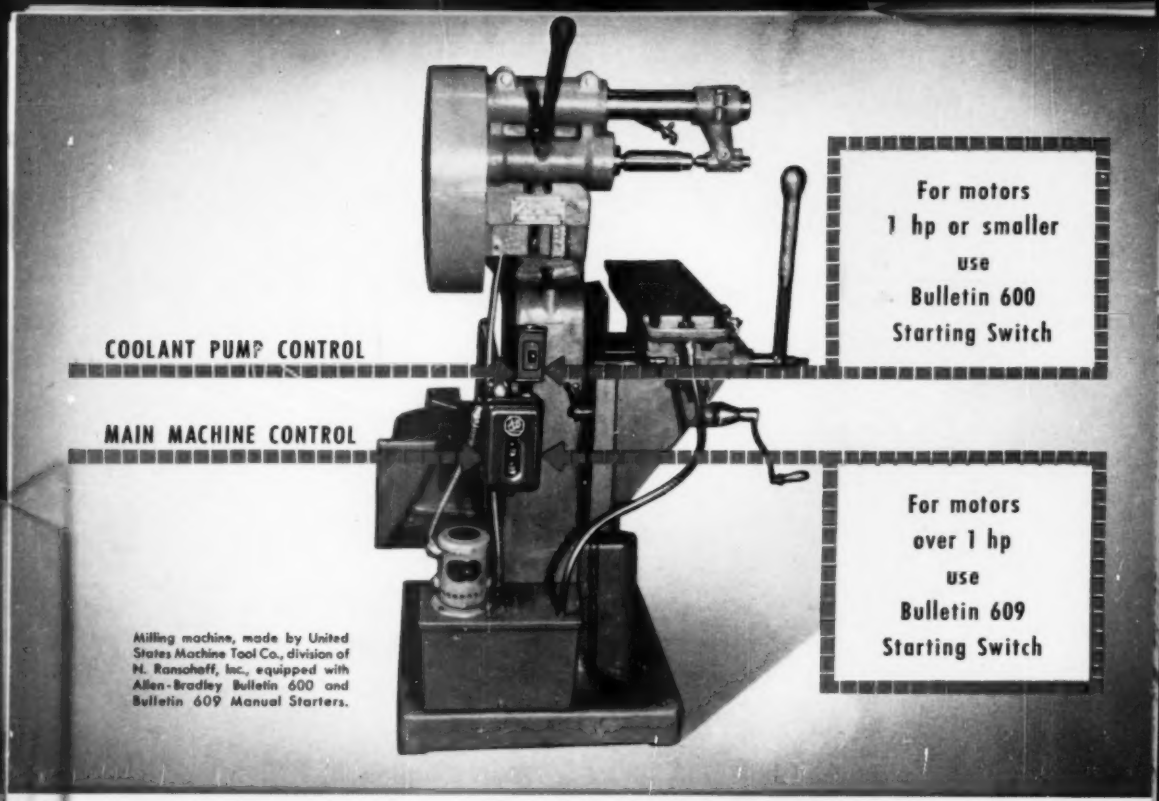
Bulletin 600 Switches are available with pilot lights, selector switches, and other accessories. Send for complete data, today.

ALLEN-BRADLEY

A-B Quality

BULLETIN 600 STARTING SWITCHES

Allen-Bradley Co.
1316 S. Second Street
Milwaukee 4, Wis.



Milling machine, made by United States Machine Tool Co., division of N. Ranschoff, Inc., equipped with Allen-Bradley Bulletin 600 and Bulletin 609 Manual Starters.

HOW TO PICK THE RIGHT MANUAL STARTER

For Motors of 1 hp or less—Specify the compact Allen-Bradley Bulletin 600 Manual Starting Switch. It is so small that it fits easily into any standard conduit switch box . . . with ample wiring space.

A self-contained thermal overload breaker trips the switch when the motor is overloaded. The switch cannot be reclosed until the overload condition is corrected. A full line of enclosures is available for every service application.

Bulletin 609 Starter in steel enclosure. Note white interior and the ample wiring space.

For Motors of 1-5 hp, 220 v—1-7½ hp, 600 v Specify the popular Allen-Bradley Bulletin 609 Manual Starter, available in enclosures for general, waterproof, dust-tight, and hazardous locations.

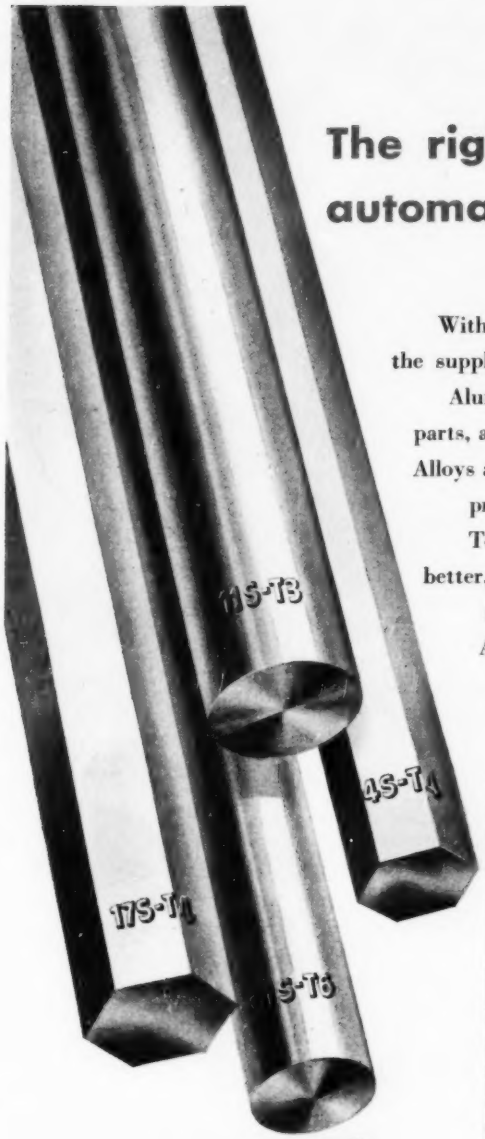
Quick-make and quick-break silver alloy contacts . . . double overload breakers . . . and handy push-button operation are a few of the assets of this popular manual starter. Available also for mounting in machine bases.

Send for Third Edition of Allen-Bradley Condensed Catalog . . . . just off the press.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY
MANUAL AND AUTOMATIC MOTOR CONTROLS
QUALITY

A-B Quality



The right aluminum alloys for automatic screw machine work

With the world demand for aluminum far exceeding the supply, you'll save metal by selecting the right Alcoa Aluminum Alloy for each job. You'll reject fewer parts, and waste less stock.

Alloys are widely different . . . each with varying properties of machinability, workability and strength. To help you know aluminum and its machining better, Alcoa offers you a free copy of "Alcoa Aluminum in Automatic Screw Machines". Write ALUMINUM COMPANY OF AMERICA, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA 11S-T3... the best general-purpose aluminum alloy for automatic screw machines.

ALCOA 17S-T4... is stronger than 11S-T3, is best for deep hole drilling.

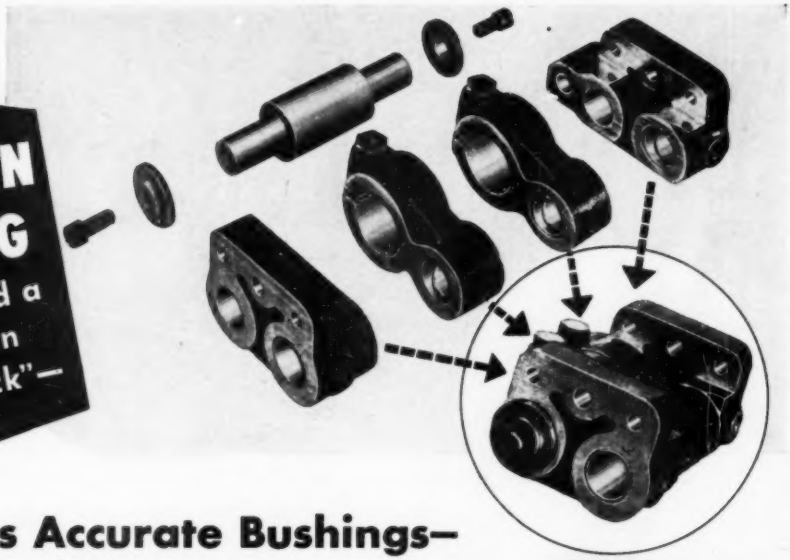
ALCOA 24S-T4... is even stronger than 17S-T4 and is used for aircraft and other high-strength applications.

ALCOA 61S-T6... has high corrosion resistance and is particularly adaptable to the patented Alumilite finish.

GOOD MACHINING PRACTICES SAVE METAL

ALCOA FIRST IN **ALUMINUM**

SUNNEN HONING Eliminated a Production "Bottleneck"—



Produces Accurate Bushings—in Perfect Alignment

...At C. B. Cottrell & Sons Co., Claybourn Div., Milwaukee, Wisconsin

A unique problem at this company was to produce sets of four paper gripper bushings to exactly the same size — and mount the grippers in *perfect alignment, spaced on a long shaft.*

Production by lapping was slow — averaged one set of four grippers per day, but Sunnen Honing put this job on a high production basis.

By using a simple fixture (shown above), the four parts are now align-honed to exact size in a matter of minutes. Better parts are produced at less cost, and they now meet production schedules with time to spare.

Many other applications in this company's plant prove the versatility of Sunnen Honing. Most applications require extreme accuracy, some are blind holes that must be straight and round — others are bushings that contain keyways. Sunnen Precision Honing Machines handle all of them, quickly and easily.

There may be similar applications for Sunnen Honing in your plant — just as there are in thousands of others.

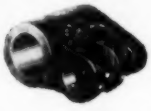
WRITE FOR BULLETIN XMAN-5 for complete details — or request that a Sunnen engineer call at your plant.

SUNNEN PRODUCTS COMPANY 7936 Manchester Ave., St. Louis 17, Mo.
Canadian Factory—Chatham, Ontario

Extreme accuracy on large diameter containing oil grooves

Geometrically true hole—free from bellmouth

Accurate alignment of two holes—with blind end



Smooth, straight, round hole produced in part with keyway

SUNNEN HONING

-402

"Low-cost production of precision holes"

IF YOU MAKE

STAMPINGS

DIE CASTINGS

PLASTICS

You Can Save Money with H-P-Ms !

MR. METALWORKER . . . here's hot news for lower production costs. . . . H-P-Ms offer you fewer rejects (less than 1% scrap loss in most cases), deeper draws (the washer tub above required only a single stroke!). With H-P-Ms you're not confined to deep draw stocks . . . irregular sheet can be drawn with ease. This all adds up to greater profits for you. *Write for Bulletin 4706.*

MR. DIECASTER: You have the fastest, low cost casting process, but did you know H-P-Ms have greater injection capacity, less chance for die "spitting", quicker die set-up, full automatic control with hydraulic ejectors and core pulls? You can't beat H-P-Ms. They're tops! *Write for Bulletin 4803.*

MR. PLASTICS MOLDER: Capitalize on today's metal shortages. Plastic materials are plentiful! H-P-Ms full hydraulic control guarantees a fast cycle with minimum rejects. Die set-up is a cinch . . . no toggles, cams or links to adjust! Regardless of your molding job . . . injection, compression or transfer . . . H-P-Ms are confirmed profit makers! *Write for Bulletin 4802.*

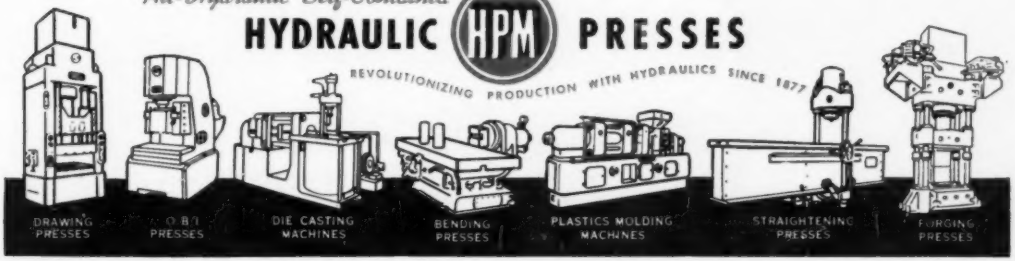
THE HYDRAULIC PRESS MFG. CO.

1002 Marion Road **Mount Gilead, Ohio, U.S.A.**

All-Hydraulic Self-Contained

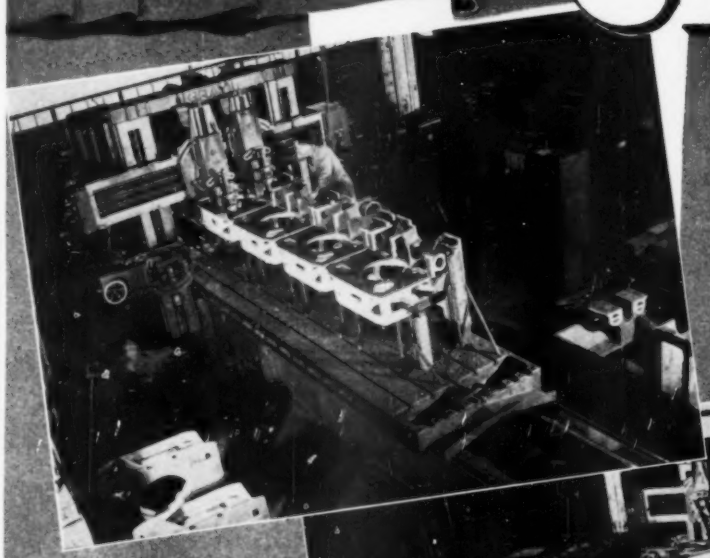
HYDRAULIC HPM PRESSES

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

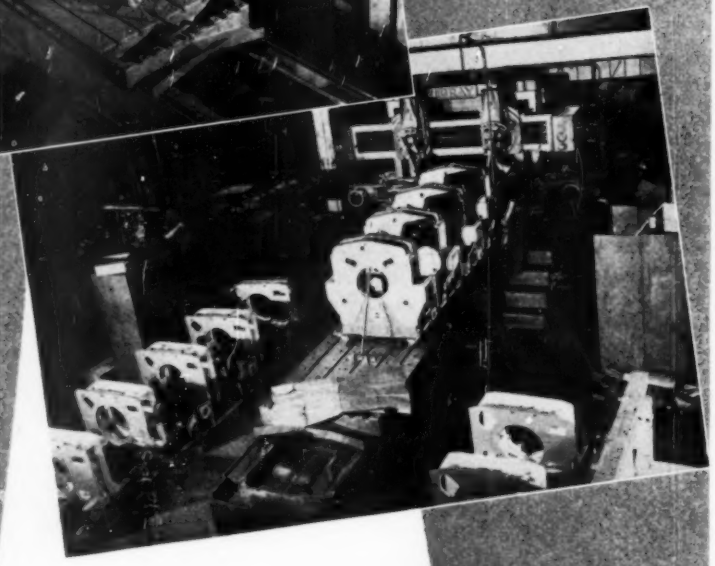


New Performance

STARRING THE NEW GRAY



Both settings of these New Britain frames planed at record-breaking speed, using carbide tools.



Job is being done on GRAY PLANERS in New Britain Gridley plant. Heavy feeds, multiple head operation, and cut and return speeds available up to 300 ft. per minute, reduce production costs.

CAN YOU COMPETE? BETTER INVESTIGATE THE NEW GRAY

The G.A. GRAY Company

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

HIGH PRODUCTION BROACHING *At Low Cost*

WITH *American's* MANUALLY OPERATED V-2 12 TON PRESS

When you call in *American's* experienced broach engineers, high production broaching can be had at a surprisingly low investment. Their adaptation of the V-2 12 Ton Press (right) for broaching flats on automotive clutch pedal shaft assemblies is a typical example.

American engineers got the required production by tooling up the press with a simplified two-station work holding fixture, shown below.

In operation, two parts are loaded in fixture and clamped by independent hydraulic circuit. Machine cycle is started by hand lever or foot pedal. At end of stroke, ram stops in down position and operator unloads parts. Operator then returns ram to up position. Broach holders are hardened and ground, and guided in the fixture proper to give accurate alignment.

Fixture is arranged with two stations located one above the other. Parts are located from O.D. of the shaft and indexed from the lug portion.

In addition to the presses, *American* manufactures a complete line of broaching equipment: horizontal and vertical machines in various sizes and tonnages as well as standard and special broaches, push and pull heads, and work holding fixtures to meet the broaching requirements of the metal working industries.

Whether your broach requirements are similar to that shown or entirely different, *American's* experienced engineers will, on receipt of your blue print, recommend machine and tooling for the accurate and economical broaching of the required operation without obligation.

American is the one source for *all* your broaching needs—see *American* first.

Write for Free Circulars on *American* Presses

Free circulars on *American* V-1½ 4 Ton and V-2 6 and 12 Ton Presses are available on request. Write for your copies today. Ask for Circulars V-½G and V2G.

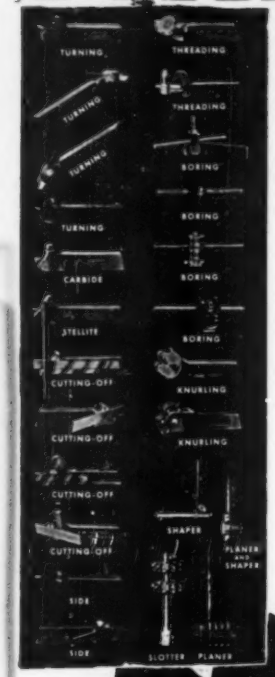
American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

ARMSTRONG



More Tools Per Man for More Profit

Even when labor was cheap and tools were costly, it was the best tooled shops that prospered. Now with wages higher and the work days shorter, it becomes imperative that every worker be supplied with every tool that will increase his hourly production.

See that each lathe, planer and shaper operator has the correct ARMSTRONG TOOL HOLDERS for each operation he performs. Equip each machine with its full complement of ARMSTRONG Setting-up tools. Use better balanced, handier ARMSTRONG WRENCHES on machines and assembly lines. Specify ARMSTRONG Drop Forged "C" Clamps and Lathe Dogs. . . . Today, only quality tools can be truly economical.

Write for the NEW S-48 Catalog just released. It has page after page of production-increasing, cost-cutting tools.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 West Armstrong Avenue Chicago 30, U. S. A.

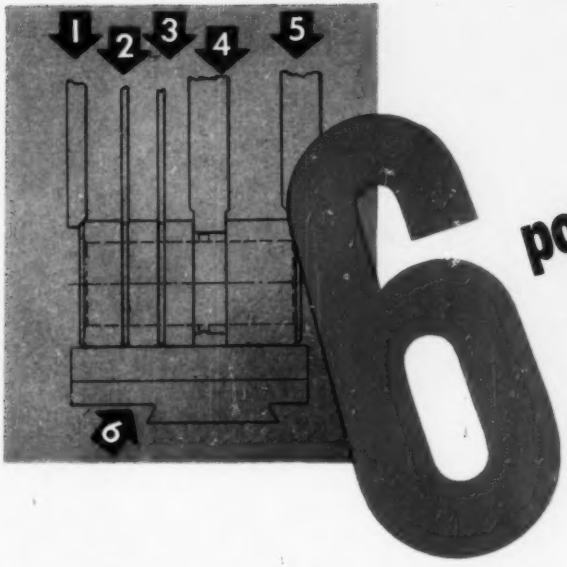
Pacific Coast Whse. and Sales Office: 1275 Mission St., San Francisco 3

Eastern Whse. & Sales: 199 Lafayette St., N. Y. 12, N. Y.

Write for Bulletins on—

(a) ARMSTRONG Carbide Tool Holders and ARMIDE Carbide Cutters

(b) ARMSTRONG CA Tool Holders and ARMALOY Cast Alloy Cutters



6 point savings in tools...

WHEN THE TOOLS ARE TANTUNG

Tantung tools produced, in 6¾ hours, the work formerly requiring 13½ hours with high speed steel tools

Actual performance figures obtained in shops all over the country repeatedly prove Tantung superiority over high speed steel tools on jobs requiring increased production and tool life.

6 Tantung tools in a multiple tool set-up for grooving, chamfering, turning, facing and cut-off operations again pointed the way to doubled performance AT NO EXTRA COST!

For more pieces per grind at speeds and feeds above high speed steels and just below those of carbides your choice should be TANTUNG.

It's that extra speed and feed on your present equipment that means more profitable metal removing operations for you...and that extra speed and feed is obtained easily with TANTUNG.

Here's a multiple tool operation that enabled a mass production manufacturer to double his production at no extra cost.

Performance Data

MACHINE:	Conomatic, 8 spindle.
PART:	Overdrive Stationary Gear.
MATERIAL:	S.A.E. 4042 (cold drawn).
OPERATION:	Grooving, chamfering, facing, turning and cut-off operations to close tolerances and fine finish.

Comparative Test Data

	TANTUNG	H.S.S.
Rev. Per. Min.	305	230
S.F.M.	135	105
Cycle Time	24.5 sec.	37.0 sec.
Pieces per grind	1000	425
Feed: Front slide	.0014	.0006
Back slide	.003	.0015

For that extra added performance that means a greater margin of profitable operation with TANTUNG call your nearest V-R branch office TODAY! If you want increased production over high speed steel tools and are unable to use carbides because of equipment limitations TANTUNG is your answer.

District Sales and Service in Principal Cities

V-R CARBIDE and TANTUNG

vascoloy-ramet corporation

WAUKEGAN • ILLINOIS

An affiliate of The Fansteel Metallurgical Corporation and The Vanadium Alloys Steel Company

BEGINNING A
SECOND CENTURY OF

Service

TO INDUSTRY

1848
1949

INDUSTRY NEEDS THE BEST in cutting tools that it may obtain high volume production. Realizing this, Whitman & Barnes commences its SECOND CENTURY with confidence, for only cutting tools that have proven their worth through the years will satisfactorily meet industry's requirements.

Increased production is the objective of all industry. Cost per unit decreases as volume increases. W&B Drills, Reamers, Punches, etc., are invaluable aids in the attainment of capacity production.

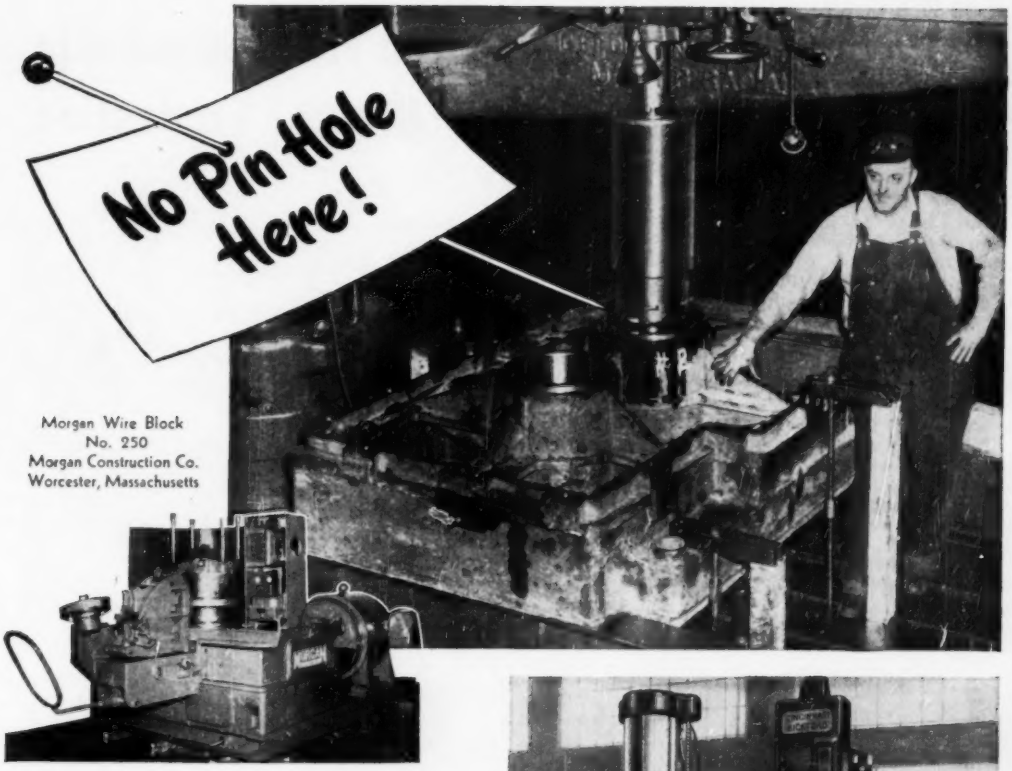
There is a W&B distributor in your vicinity!

●

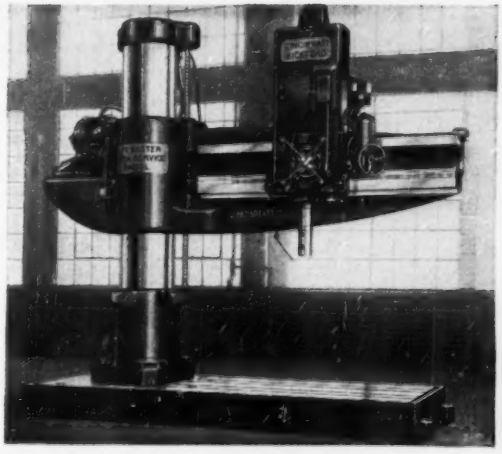
W&B

TWIST DRILLS • REAMERS
CARBIDE TIPPED TOOLS • SPECIAL TOOLS
INTERCHANGEABLE PUNCHES

WHITMAN & BARNES DETROIT • NEW YORK • CHICAGO LOS ANGELES • HOUSTON



Morgan Wire Block
No. 250
Morgan Construction Co.
Worcester, Massachusetts



If your work is big, the Cincinnati Bickford Master Super Service Radial offers the power and rigidity that are definitely required. It is easily operated, and the centralized controls answer to a touch.

Highly accurate, with capacities far in excess of what today's cutting tools will stand, it handles unusually large castings economically and efficiently.

The 26" column, 12' arm, with forty horsepower, constant speed motor, is one of the largest Radial Drills built

If your work is big—write for Bulletin R-22.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES
Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

DANLY PRESSES give you the Dependable Press Operation that means Greater Production

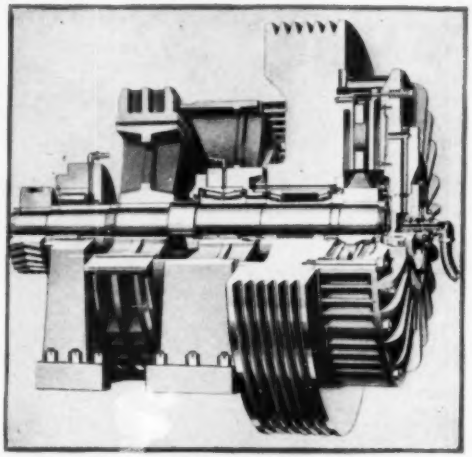
Danly Presses are fabricated from extra heavy plate that resists shock and cuts down deflection—keeps the accuracy that means precision parts over years of usage. Every feature of these presses is designed for smooth, easy operation with a minimum of day to day maintenance.

The lubrication system, for example, supplies circulating filtered oil to all gears, bearings, and driving members in the crown and slide *including the flywheel bearings.* Consequently, manual lubrication of these bearings at the top of the press is unnecessary.

Pushbutton controlling lessens operator fatigue and increases his safety. Completely enclosed construction speeds loading and scrap removal.

Danly has engaged in the manufacture of products related to the entire stamping industry for a quarter of a century.

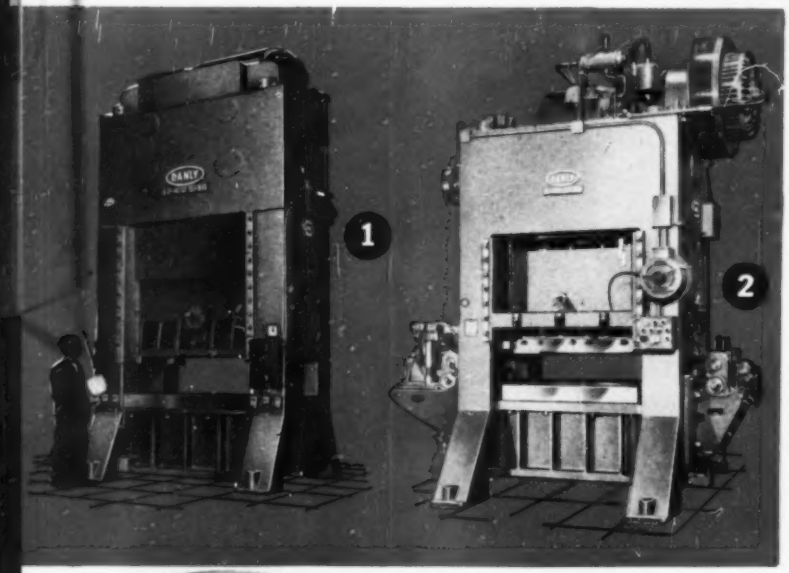
Freely consult Danly's Press Sales Division for suggestions on the press that will increase your production.



New Disc-Type Air Friction Clutch Reduces Maintenance and Costly "Downtime"

Most of the moving parts of the Danly Air Friction Clutch are assembled directly to the flywheel, rotate with it at all times, and contribute to flywheel energy. The Clutch Housing itself is a ventilating fan which carries off the small amount of heat generated by the action of the clutch and brake.

This cool operation and the light weight of the few parts "picked up" by the flywheel when the press is engaged, reduce maintenance and costly Downtime.



1 Straight-side Eccentric Gear presses are available with 1, 2, and 4 suspension points or slide connections. Capacities range from 100 tons up in single and 2 point presses and from 200 tons up in 4 point presses.

2 High Production presses like this one supply the answer to volume automatic production on thin and heavy gauge strip. Their great accuracy makes them ideal for lamination and other precision stamping jobs. Capacities range from 50 tons up.

DANLY

DANLY MACHINE SPECIALTIES, INC.

2100 SOUTH 52ND AVENUE CHICAGO 50, ILLINOIS

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION DIE SETS...STANDARD AND SPECIAL • MECHANICAL PRESSES AND PRESS EQUIPMENT

SPOT NEWS OF METALWORKING

Midwest labor rates have risen so sharply that one automobile maker can get fabricated steel parts for its cars delivered to its Middle West assembly plants from Los Angeles cheaper than it can from its former suppliers in Ohio.

Atomic heat experiments indicate that the making of steel by atomic power may be possible within five years. Melting of non-ferrous metals with atomic heat is part of the developmental work. If the program works out, foundries eventually will be independent of oil and coal supplies and can be located in spots heretofore uneconomical.

Machinery, motor vehicles and iron and steel mill products should hold gains made recently in ECA procurement authorizations and should improve their positions over the next four years. Industrial commodities now take 60 cents of every ECA dollar, reason being that Europe's production of goods is up 25% over the 1947 level.

India is planning a State-owned machine tool factory with investment of $15 million. A Czechoslovakian expert is surveying possibilities for the government. India's annual machine tool needs are $27 million, mainly for factories involving essential services such as railways and ordnance. In 1946 Indian plants built 8810 machine tools valued at $5.2 million. At present India has 15 "graded" and 52 "ungraded" machine tool builders.

New approach to automatic transmission: one company is reported to have developed an enclosed wet-type clutch to get smooth engagement like a fluid coupling but without its slip. Combined with clutch is planetary transmission and automatic control.

Automobile engine mufflers are being made of stainless steel with terne plate baffles. Aluminized steel is being tried as a substitute for stainless for muffler shells.

Several automobile makers are figuring how much it will cost to truck all parts to branch assembly plants, now that rail rates are so high. If another rate increase is allowed, they are prepared to truck to east coast and midwest plants and to ship by boat from eastern ports to Pacific Coast and Gulf Coast plants.

Steel allocations programs will be taking about 20% of finished steel production by March 1. If ECA shipments come near Commerce Department projections, cut into steel production will be even heavier. At year-end, steel plate was 42.8% allocated.

Neither Air Force nor Naval Air can keep up present programs, much less expand them, if $15-billion ceiling is imposed on national budgets in fiscal '50.

A 10-cent-an-hour increase already has been granted by a few midwest metalworking firms as a fourth-round wage settlement.

New 850-hp air-cooled Continental engines, to be used in V-12 tanks by Ordnance Department of U.S. Army, are so much lighter and more compact than previous 600-hp engine that over 100 gal. more of fuel can be carried. Tank has new hydraulic torque converter drive.

Factory to make twist drills is to be built in The Netherlands backed by Dutch, Belgian and American money. Diesel engines also will be made in Holland by a company formed by combination of leading Dutch engine manufacturing companies.

Gaging Metalworking

Metalworking goes into 1949 with production holding at a high level. Though some machinery lines, notably machine tools, do not have enough business to keep their facilities busy, demand for both durable and consumer goods stays remarkably strong. Lay-offs are reported here and there, but they are local and, on the whole, are not serious.

▸ January promises to be a very satisfactory month in orders and production. In many cases, steel shortages are a more serious problem than sales. Nevertheless, a buyer's market is at hand in almost all metalworking commodities, and from now on manufacturers will have to fight harder for business.

Aircraft Employment To Rise

Aircraft industry enters 1949 in the black for the first time since V-J Day. It delivered last year $1.25 billion of planes and engines, not much more than the previous year. But plane components have been drastically revised, with the accent now on military production.

▸ Employment rose 50,000 during the year to a total of 225,000. Heaviest gain was in the airframe industry, with 40,000 new workers hired. This gain probably will be doubled and perhaps tripled this year. By contrast, the engine industry took on new people slowly because of special skills needed and high mechanization of output.

Foreign Machine Tool Sales Spurt

The amount of foreign business coming into builders' offices is the outstanding feature of the machine tool industry. December probably kept pace with November, when 18.5% of total bookings were for export. That was the highest percentage since April, 1947. The bulk of the business originated in Europe, as did December foreign orders.

▸ Builders say that recent sales have been made in Italy, Norway, Denmark, Holland, Belgium, Switzerland and France. Britain also is taking a considerable number of U.S. machines, the emphasis being on special-purpose, mass-production types. The Rootes automotive interests, for instance, are in the market now for American machines for retooling their factories.

▸ Much of the European business placed here is outside ECA financing. Some of the money, particularly in Austria and Italy, is being supplied by the Export-Import Bank. One point should be cleared up: the $56 million, to be spent by ECA countries for U.S. machine tools in fiscal '49 takes care of their total purchases, through ECA or otherwise.

Domestic Demand Erratic

Domestic machine tool sales have been erratic, with some companies doing a very satisfactory volume while others have had thin pickings. The planer people are enjoying an active demand, and backlogs extend up to a year. Most radial drill builders are doing a good business. The same situation exists in boring mills. Engine lathe orders are off some, but not too seriously. Slackness in automotive buying has hurt operations among certain builders making special machinery for the automotive industry.

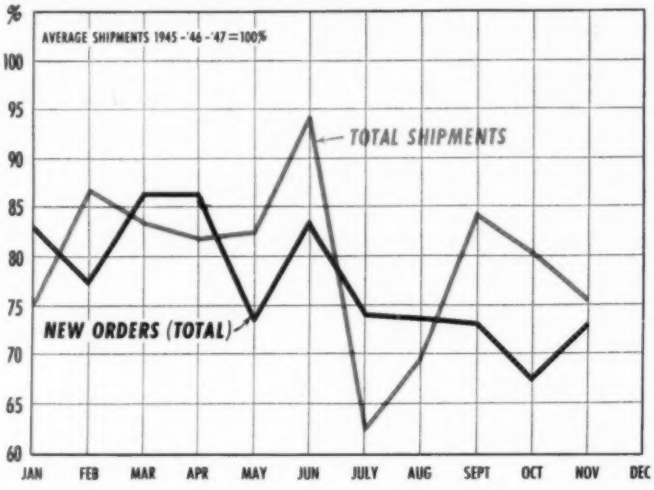
Impact of Air Program Felt

Though military aircraft deliveries were up one-third in 1948 over the previous year, impact of the new Air Force program is just beginning to

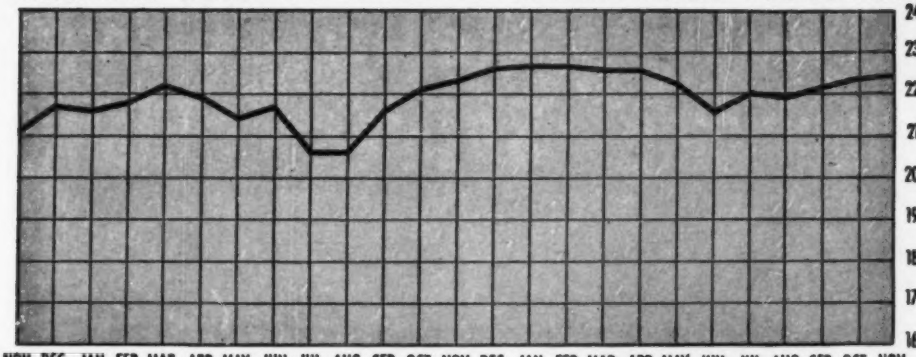
MACHINE TOOL ORDERS RISE AS SHIPMENTS FALL OFF

Date (1948)	New Orders (Total)	Foreign Orders (Included in Total)	Shipments (Total)
Jan.	83.1	14.0	75.3
Feb.	77.3	12.7	87.1
Mar.	86.3	16.1	83.6
Apr.	86.3	14.1	82.0
May	73.5	11.4	82.6
June	83.4	11.9	94.4
July	74.0	13.3	62.4
Aug.	73.7	13.6	69.8
Sept.	73.1	11.6	84.7
Oct.	67.4	14.0	80.4
Nov.	p 73.0	p 18.5	p 75.5

p — Preliminary figures



American Machinist INDEX OF METALWORKING PRODUCTION



INDEX		COMPONENTS				
		MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
Nov. 1948.....	224	250	236	223	311	159
Oct. 1948.....	223	250	235	223	311	155
Nov. 1947.....	223	244	244	227	293	154

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1 Index figures are a percentage of 1939, which equals 100.

be felt. Fiscal '49 procurement program will not affect the industry much until late this year. Meanwhile production continues on types tooled up as early as 1945.

▸ It appears that the Air Force and Naval Air are headed for real trouble in their fiscal 1950 budgets, already laid before Congress. Hence there is no hat-throwing by the industry. Barring any actual cutbacks in current commitments, however, the industry anticipates a record-breaking peacetime year in 1949.

Resistance Welder Sales Up

Foreign orders for resistance welding equipment spurted in November to the highest level since April, according to the Resistance Welder Manufacturers Association. They were within 11% of total foreign business booked in the entire third quarter. Shipments by the industry to all customers were up 45% from the same month in 1947. Demand for electrodes is continuing at an all-time peak.

Steel Tighter Than Ever

Not much headway is being made in solving the steel shortage. Voluntary allocations are almost sure to be continued for six months beyond March; and companies not sharing in these allotments are likely to get further cuts in tonnages from mills.

▸ All sorts of conversion deals still are being made. And all of them are extremely costly. A certain amount of barter also is indulged in to secure steel. Example: one automobile manufacturer is trading automobiles for Belgian-made steel to add to the supply for production of many parts.

▸ There are some indications that steel demand may ease later in the year, but not until July at the earliest. The scrap situation has improved a little. Also, steel mills are in better shape physically.

Copper Is Critical

Copper is more critical than ever. The largest domestic mine still is on strike, with no prospect of an early settlement. Foreign copper will not be coming into the country again in volume until February. On top of these unfavorable factors, the government is continuing to buy for stockpiling and will take a considerable portion of the supply during the first half of 1949.

▸ Brass mill deliveries range from stock to about six weeks. Volume of new business is off. Deliveries of copper wire mill products are about normal, although demand remains heavy. The price remained firm but there were no indications or move that the price would be increased in the near future.

▸ Production of primary aluminum slumped in November almost 8 million pounds. Output in November was 101,391,093 against 109,053,311 pounds in October. Shipments of sheet fell off almost 3 million pounds in November from the previous month to 106,227,981 pounds.

Aluminum promises to become still harder to get in 1949. Production of primary aluminum in 1948 is estimated at about 1,245,000,000 pounds, but leading producers expect the 1949 output to be considerably lower. This will increase the squeeze on users other than the aircraft industries.

▸ Producers of lead are experiencing no difficulty in disposing of their supplies, but many consumers are refusing to buy the metal at premium prices.

▸ The firm market that prevailed during 1948 for zinc is expected to continue late into 1949. The price remained unchanged through the year-end.

▸ Meanwhile, nickel deliveries in 1948 set a new peacetime record.

Better Machining | Greater Savings | Cleaner Plant

when you use *Texaco Soluble Oil Heavy Duty*

Courtesy American Broach & Machine Company

EMULSIONS made with *Texaco Soluble Oil Heavy Duty* have replaced straight cutting oils on many broaching, drilling, turning and threading jobs. Better, faster machining, worthwhile savings, and cleaner plants have resulted.

When you use *Texaco Soluble Oil Heavy Duty*, there is less carry-off which, in turn, means savings in material consumption as well as in clean-up expense. Emulsions with *Texaco Soluble Oil Heavy Duty*, cool the work better . . . assure faster production . . . longer tool life.

There is a complete line of Texaco Cutting, Grinding and Soluble Oils. Let a Texaco Lubrication Engineer show you where and how you can improve your machining efficiency. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 E. 42nd St., N. Y. 17, N. Y.

TEXACO REG'D T

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Tune in . . . TEXACO STAR THEATRE presents MILTON BERLE every Wednesday night. METROPOLITAN OPERA broadcasts every Saturday afternoon.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

State of the Industry

"We have our fingers crossed about 1949. Dewey is not in the White House, and that is bad. Congress is getting ready to do what the labor folks want. Taxes are sure to go up.

"Moreover, business is not as good as it was. The boom is over. Orders are harder to get and backlogs are melting. Labor rates are sky-high and still headed up. Prices, on the other hand, cannot be pushed much higher because competition is back. And what about profits?"

That is the theme song that many a metalworking manufacturer is singing, or at least humming. But it has many discordant notes. It is not a pretty tune. It should not be adopted as our national business anthem.

Let's look at some of the facts: The initial pent-up postwar demand for goods in most lines has been satisfied. The crowding into the market to grab anything and everything available has eased. The abnormal is about to be replaced by the normal.

That is no reason to assume that we are about to go into an economic tailspin. We have full, or nearly full, employment. We are pouring more wages into the pockets of workers all over the land than ever before. Farmers are flourishing beyond their fondest dreams of a few years ago.

American industry will be spending almost as much for new plant and equipment this year as last, according to preliminary figures from a nation-wide survey. Last year a record nineteen billion dollars was invested.

The world's need for American goods is far from being met. What with the Marshall Plan and other stimulants, U. S. machinery and goods of all kinds will be flowing from our shores to countries round the world in a surging volume.

There will be lots of business, but perhaps not quite as much as in the lush years of 1946, 1947 and 1948. It can be secured by managements which go after it and make their plans accordingly.

We are back in the days of automobile shows: witness the General Motors affair in New York this month. We are back in the days of new models in numerous products, models which have improvements obsoleting the old types.

Good old-fashioned competition once again is asserting itself. But that is no reason to lose one's nerve and give up. It is time to realize, however, that the coasting era is over. Orders will go to the companies which fight for them and earn them.

There will be greater stress upon prices, upon plant efficiency, upon productivity of the worker, upon squeezing profits out of narrowing margin. Our wartime extravagances must be stamped out. More attention must be given to lowering the labor content of the product to get costs down.

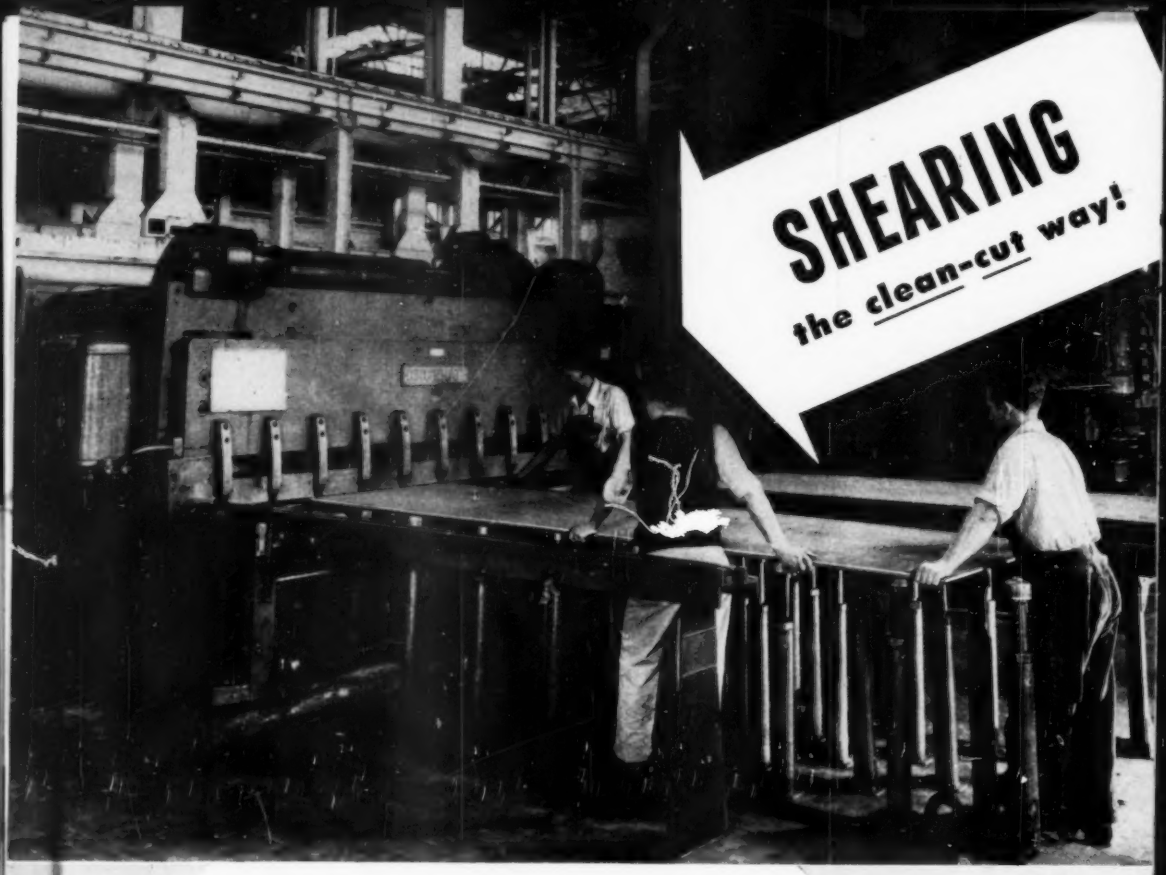
We like the spirit of companies such as Jones & Laughlin Steel Corporation which has just announced that it is spending $210,000,000 out of earnings to improve its steelmaking facilities. In its management's own words, "We're backing a sure thing—the future of the United States."

There are many other companies with the same point of view as Jones & Laughlin. We salute them, because we feel that they are doing a job which will help to keep our economy prosperous and free from excessive government control.

As we see it, business promises to be unusually good this year. The favorable factors far overshadow the unfavorable. But it is no time to sit back and bemoan the fate which is overtaking us. Our business salvation is in our own hands.

Burnham Finney

EDITOR



This ¾-inch shear is cutting plate rapidly and accurately with a sharp reduction in cost over other methods.

The 36 or 48-inch micrometer back gauge is a valuable time saver for cutting plate to size. To accommodate extra long plates, the Cincinnati back angle swings up out of the way.

When it is desirable to shear to a scribed line, the Cincinnati light beam gauge positions the plate rapidly and accurately.

Plates roll easily across Cincinnati tables on ball transfers, cutting handling time and physical effort.

Cincinnati inclined rams present the corner of the knife to the work and shear straight and clean.

Cincinnati features ensure quick handling, accurate work and low shearing costs.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

What NOT to do when RESISTANCE WELDING

Good resistance welds are not made with antique equipment and makeshift setups . . . Here are typical wrong practices and their corrections

BY R. T. GILLETTE
WORKS LABORATORY, GENERAL ELECTRIC COMPANY

WHEN starting a resistance-welding program or improving an existing setup, don't guess.

The complete program should be studied from various angles, such as design of parts, selection of the proper material for the product, selection of the welding equipment best suited to the product (equipment purchased on a low-cost basis may not always be the most economical in the long run), operating personnel, maintenance, and lubrication.

Questionable practices may creep into the welding setup. Methods, equipment, and personnel should be reviewed frequently, as there is always a chance to find a better way to make a product at a lower cost by change in materials, methods, design, or equipment. Reviewing some of these points in detail is a good way of pointing out some of the don'ts.

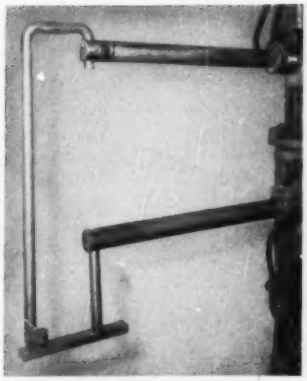
The fact that a design has been produced by other methods of fabrication is no criterion that that design is the best for assembly by welding. For example, joints should not be planned and then the welding machine fitted to them. The welding machines themselves, as well as the product, should be kept in mind, and the joints designed so that they are accessible for welding without complicated machines and fixtures.

Simplicity always helps; a design which requires an electrode setup like the one shown in Fig. 1 is basically wrong and should be changed. A structure shouldn't be designed and hundreds or thousands of parts made before the welding factors are checked. A careful review of the drawings, from a welding angle, before parts are made, pays dividends. Changes on paper cost less than changes in parts.

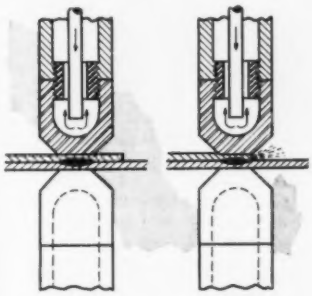
Sufficient overlap should be allowed on all joints to accommodate the proper size weld, without making it necessary to weld so close to the edge that metal expulsion results, Fig. 2. Tabulated information is available giving dimensions of these overlaps. The factory shouldn't be left to guess where, what type, or how much welding is to be applied. Full information should be given on the drawings.

Spacing between welds should be adequate to avoid shunting of current through previously made welds. In cases where very close spacing is necessary, projection rather than spotwelding may be the answer. As an example, for a right-angle lap between two pieces of steel 5/8 in. wide and 1/16 in. thick, the first thought might be to specify four spotwelds. Actually, it would be impossible to make more than one good one on that area, but four small projection welds could be used.

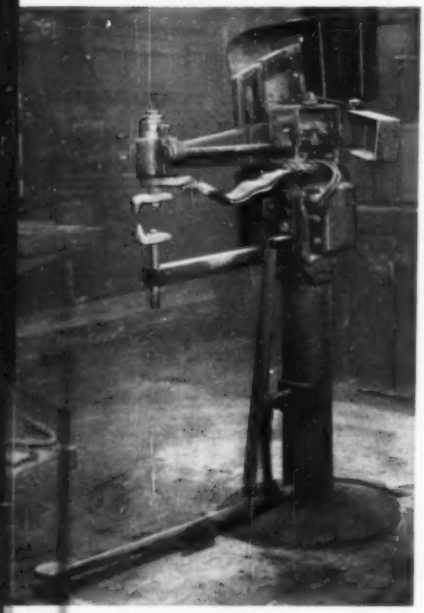
Material plays an important part in any successful welding program. In addition to being selected to suit the product, it should be consistently the same from various shipments, be free from dirt, scale, and laminations, and unless some post heat-treatment is used, the carbon should be kept low. It must also be low in phosphorus and sulphur; the so-called free-machining steels containing high sulphur and



1 **Spotwelding setup** that is extremely poor. A product design that requires such a setup is basically wrong



2 **Proper lap** will confine the metal; insufficient lap will cause expulsion of the molten metal



3 **Antique spotwelder** is manually operated, has no water cooling, high-resistance alloy arms; is in poor mechanical condition

phosphorus cannot be satisfactorily welded.

While dissimilar metal combinations, both ferrous and non-ferrous can be welded in many combinations, the alloying properties should be studied so that dissimilar combinations of materials when welded will not form brittle alloys. Consistent results cannot be expected on material that has loose mill scale, rust, oil, or grease, with the attendant pickup of sand and other dirt. The best welding results are obtained by cleaning the material so that it has a consistently low surface resistance. Erratic surface resistance produces erratic welds.

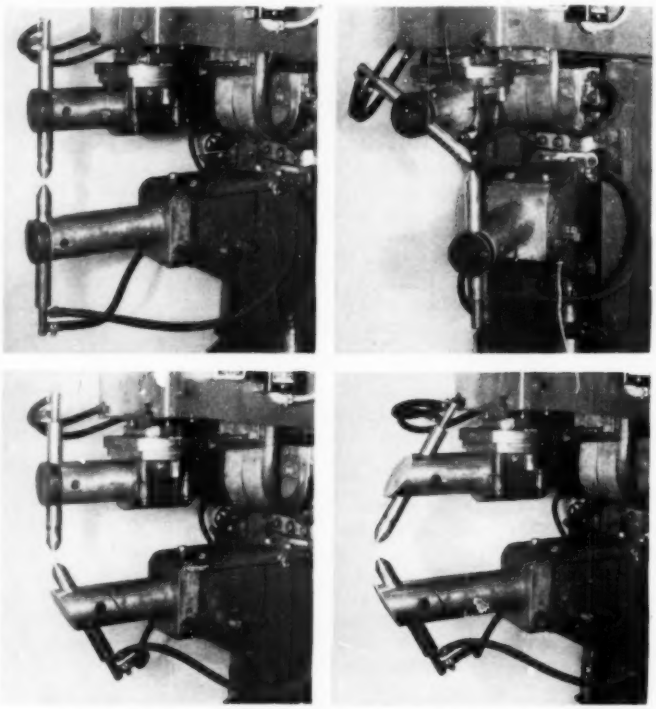
The choice of the proper equipment is one of the most important factors to consider on any welding project. Manually operated and controlled equipment has killed many good welding jobs. There is still a great deal of equipment in existence like the spotwelder shown in Fig. 3. This is manually operated and controlled, has no water cooling, and, all in all, is a makeshift piece of equipment. A superintendent would throw up his hands in horror at a foot-power lathe, but this is in the same category. Being only a welder, however, it is used; the welding process, not the equipment, is then blamed for the poor results.

Welders should be considered machine tools, not just another gadget. The welder hasn't been built that will weld everything, however. In spot or seam welding, a welder designed to weld material 0.010 in. thick should not be expected to weld material $\frac{1}{4}$ in. to $\frac{3}{8}$ in. thick; likewise, one designed for $\frac{1}{4}$-in. or $\frac{3}{8}$-in. is not practical on 0.010-in. material. Similarly, a flash or upset welder for stock of 3-in. dia. should not be expected to weld wire of 0.010-in. dia.

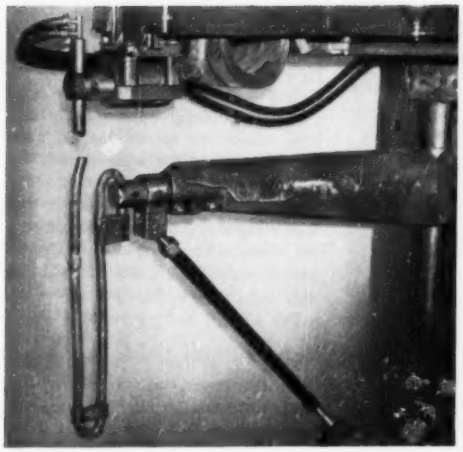
The throat or area inclosed by the secondary circuit of a welder should be kept as small as possible to give electrical efficiency. Buying a welder with a 36-in. throat, when one with a 12-in. throat will do the job, on the chance that sometime a job requiring a 36-in. throat might come along, is false economy. A penalty in high power costs is the result throughout the life of the welder.

Welders with too low mechanical or electrical capacity are not economical, either. Mechanically, they may have excessive deflection, causing slipping or skidding of electrodes with excessive metal pick-up, or insufficient force properly to forge a weld. Electrically, the time required to make a weld may be too long, causing excessive heating of the material by heat conducted away from the weld. This will result in excessive distortion and buckling of parts.

Consideration should also be given to flexibility in equipment. As an example, by purchasing a spotwelder with reversible arms

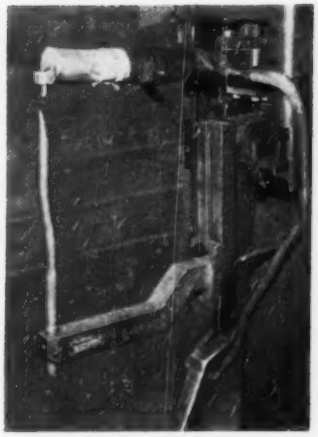


4 **Flexible welder** can be set up for simple work, irregular work, or single- or double-flanged parts. Electrodes, drilled 90° at one end and 30° at the other, are reversible



5 **Excessive throat depth increases resistance reactance and causes undue deflection** ←

→ **6** **Excessive throat area,** no water cooling and poor maintenance are evident on this spot-welder



drilled 90° at one end and 30° at the other, many different setups may be made on one machine, Fig. 4. With a small additional outlay, the flexibility of the welding machine can be greatly increased, and nearly all properly designed jobs may be done with these combinations.

In direct comparison with these ideal arrangements are arrangements like the ones shown in Figs. 5 and 6. These electrode setups are weak mechanically, are not water-cooled, making for excessive electrode maintenance. From the angle of electrical efficiency, they are about as bad as possible. If such equipment as this is required to weld a particular structure, the design is not practical and the part should be redesigned.

Fixtures Non-Magnetic

It should also be remembered that an improperly designed fixture may spoil an otherwise good welding procedure. Fixtures should be made of non-magnetic material, since magnetic material gets hot from induced currents, cuts down the electrical efficiency of the welder, and may give trouble loading and unloading parts. Fixtures should be insulated wherever necessary, to prevent short circuiting all or part of the welding current through the fixtures. In cases where sliding, rotating, or other movable joints are necessary in a fixture or jig to carry the welding current, they should be bridged with a flexible connection wherever possible. Movable joints may develop high-resistance because of build-up of oil, dust, and other foreign material.

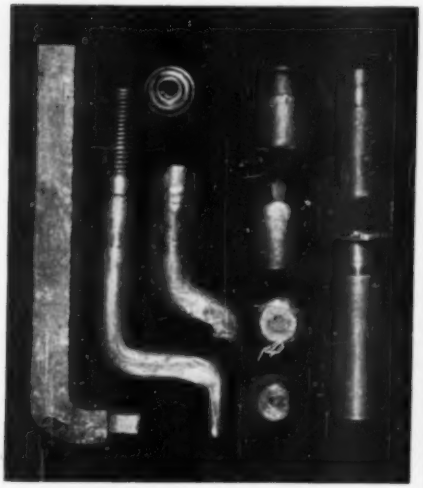
Many times an entire jig can be made from one of the cloth-base plastic sheets which are light to handle, wear well, and machine easily. Furthermore, there is no question of where or how to insulate; wood or fiber are not satisfactory because of their high moisture-absorbing properties. Jigs and fixtures should be made as simple as possible with all parts accessible for repair or replacement. All should be water cooled.

The proper alloy in resistance-welding electrodes is necessary for a good job. Even though the first cost may be high, the longer life makes it more economical. Electrodes must be properly water cooled if a practical life is expected of them and good welding is desired. Proper contour and area for the electrodes should be developed and then maintained. Tips should never be allowed to mushroom like those in Fig. 7. If a job is set up with an electrode of a given area, then contours are allowed to become badly deformed and increase in area, the welding current density per area will change to a point where no weld will be made.

Trick or freak electrodes should be avoided; such devices as continuously renewable points, rotating points, and sheet-metal strips are clumsy, do not lend themselves to proper water cooling, and require excessive maintenance. Fig. 8 shows some freaks like continuously reversible point body *A*; *B* screws onto the threaded end of *A*, *C* slides into *A*, fastens to an inside thread, and is locked into place with the locknut. While this has an elaborate water-cooling system entering through the top of *C* and out the side of *A*, it does not work because the long point of ¼-in. Elkonite has so much resistance to current flow that enough current to make a weld cannot be passed through it.

Safety Precautions

Safety is always an important question in welding. Equipment just shouldn't be operated without safety devices; jigs and fixtures should be designed so the operators cannot get their fingers under the electrodes; other moving parts should be guarded; the high-voltage end of the machine should have protective devices installed. Doors to the inside of welders and control cabinets should be locked so they are only accessible to trained electricians; the main switch should always be opened before starting any repair work. Operators should always wear safety goggles or face shields. When welding any material which



7 & 8 **Mushroomed electrodes** (left), result from lack of water cooling and proper maintenance. Parts *A*, *B*, and *C* (right) make up a single electrode. Although water cooled, the cooling is ineffective because of the long electrode point

gives off toxic fumes, the welding machine should be equipped with adequate exhaust systems.

The component parts for a welded assembly should be inspected to see if they conform to drawings and are within prescribed tolerances, also that they are free from excessive burrs and buckling and that they are properly cleaned.

A welding machine shouldn't be used for a punch press or cold header; it is not designed for that type of service and cannot correct faulty parts. A fabricated structure can only be as good as its component parts.

Makeshift or improper electrical control on welding equipment can't result in a first-quality product. Fully synchronous precision electronic controls are advisable on all resistance welders; they are as accurate and consistent as the frequency of the circuits on which they are used, and, if other factors are controlled, will give a first-quality welded product.

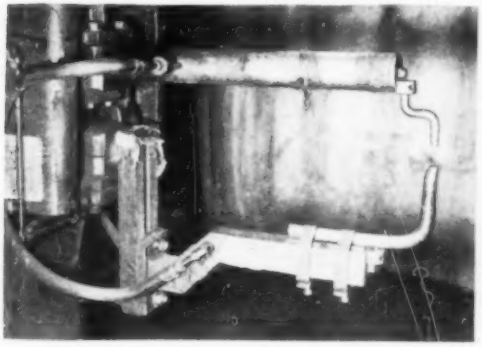
Obsolete, improperly set-up welding machines, which violate all basic concepts of good welding practice, and not welding itself should be blamed for the poor product such equipment produces. In Fig. 9, the first thing obviously wrong is complete lack of water cooling, although provisions had been made for water cooling and the two arms are still connected together with water hose. The other side is not connected to the water supply, and the lower round electrode is strapped to a flat arm, giving only a line contact which will not carry sufficient current to make a weld in a reasonable time.

Only 12 Welds

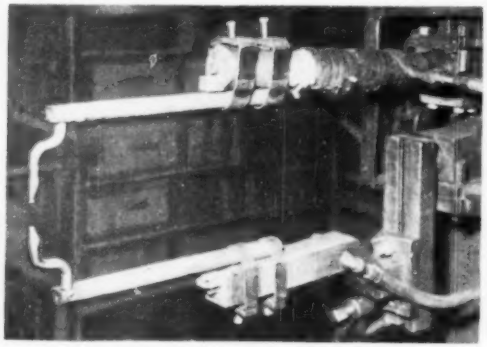
Furthermore, the upper electrode slides through a clearance hole and is fastened with a set-screw. There is not enough contact area to carry the required current without overheating, and all contacting surfaces in the secondary circuit are badly oxidized, tending to overheat. When this equipment was in operation, it would make ten or twelve questionable welds, the electrodes would get red hot for an inch back from the ends and mushroom badly. Electrodes had to be redressed and welding held up until the welder cooled down to an operating temperature —scarcely a high-speed, economical production setup.

Shown in Fig. 10 is a setup having all the faults present in Fig. 9, plus an extra strapped joint and excessively long arms, which add so much reactance to the circuit that very little welding current can flow.

It is unfortunate that there is



9 **Poor contact** between electrodes and arms is only one of the faults of this setup



10 **Excessive throat depth** and an extra strapped arm result in very little welding current

still in existence at the present time a great deal of equipment like that shown in Figs. 9, 10, and 11. It cannot do a good welding job, and the welding process, not the equipment, is usually blamed. Whoever tolerates this type of equipment and maintenance must expect an inferior product at a high cost, in comparison to a low-cost, high-quality product that can be obtained when modern equipment, control, and methods are employed.

Proper Training

It is widely recognized that successful low-cost resistance welding requires thoroughly trained supervisors, inspectors, and operators. It is fortunate indeed that supervisors like the one who, questioned about his large percentage of rejected assemblies, said that "a welding machine is just a couple of copper points jiggling up and down and doesn't need any supervision or maintenance as long as the material is put through it" are comparatively rare. In the minority, also, are operators like the one who said he knew all about resistance welding but put a heavy paper shim around an undersize taper electrode and drove it into its socket; then could not understand why the machine would not weld.

Information is readily available for training personnel to successfully operate resistance-welding equipment. Not to use it is to invite poor work results.

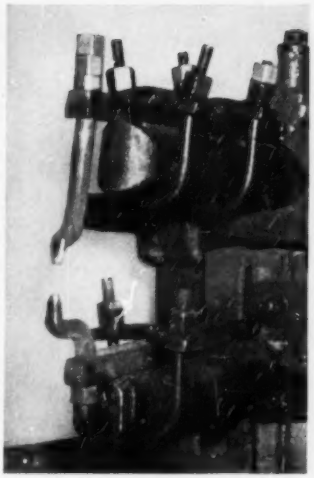
A welding machine can't operate satisfactorily for an indefinite period without proper maintenance. All moving parts should be lubricated regularly; oil and grease are cheaper than new parts. All gages and instruments for calibration should be checked frequently. All metal flash should be removed from the machine; if left on, it will eventually short-circuit the insulation.

Dust and dirt should be blown from the transformer, control, and all parts of machine, and excess oil and grease removed.

Regular checking of water flow through all water connections, particularly transformer, water-cooled electronic tubes and electrodes, is another important factor.

All current-carrying joints in the secondary circuit should be bolted up tight, but not deformed so that they have too little contacting surface. The secondary circuit should be completely disassembled at least once a year and all joints carefully cleaned before re-assembly to remove all oxide films which have formed (a welder may lose as much as 50% of its capacity because of loose and oxidized joints). It is recommended that all contacting joints be silver-plated before assembly to reduce contact resistance.

Electrodes and fixtures must be removed from welders when they require reconditioning, and be machined to size and contour. A file used on the electrodes in the machine does not give sufficient accuracy. Shims on electrodes and fixtures usually reduce the current contacting area, so that the joint will run hot. Joints should be machined to fit. A great deal of trouble has been caused by shims.

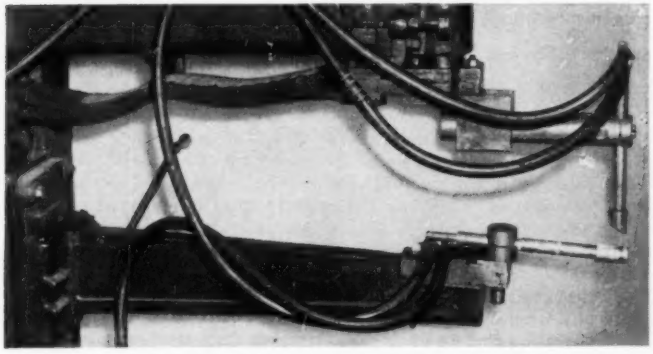


11 **Improper design** of the electrodes and lack of water cooling are among the leading faults here

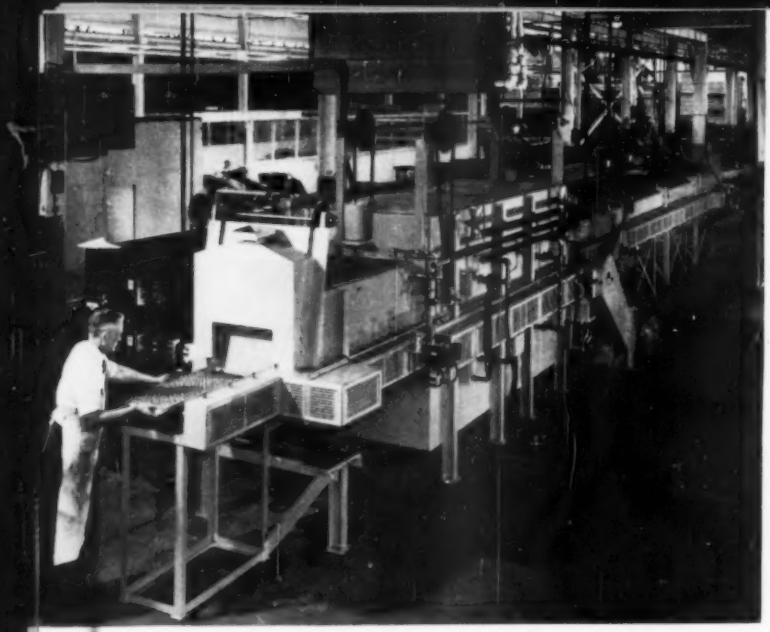
No Place for Washers

Rubber washers are real troublemakers in the joints of water-cooled electrodes. Welding engineers have traveled hundreds of miles to eliminate trouble in machines only to find that someone had repaired a water leak in an electrode with a rubber washer rather than by machining. The set-up and maintenance shown in Fig. 12 are illustrative of this. The lower electrode is mounted so that it has excessive deflection if sufficient welding force is used, and electrodes have been dressed with a file rather than remove them for proper machining.

It is well to remember that just because a job was tried once without success is no reason for not trying again. Different methods, new equipment, a change in cleaning, different material, change in design, or new information are all factors that may bring the result desired. There is nothing mysterious about welding; it is simply the proper combination of a few well-known electrical, mechanical, and metallurgical principles.



12 **Lower electrode** will not support welding force without excessive deflection



Brazing or sintering operations, when conducted in a roller-hearth furnace equipped with suitable controlled-atmosphere generator, can be done with assurance of clean or bright surfaces or satisfactory strength

WHICH ATMOSPHERE FOR HEAT-TREATING AND BRAZING?

Eight representative controlled atmospheres for furnaces have compositions and characteristics suiting them to heat-treating and brazing specific materials

BY C. E. PECK
Manager of Engineering,
Industrial Heating Division
Westinghouse Electric Corporation

In heat-treating, brazing and sintering operations, where quality and uniformity of product are required, the furnace atmosphere is usually separately generated to controlled chemical characteristics. This is true, because a furnace can be considered a chemical retort wherein the reaction depends on both the temperature and the nature of the gaseous atmospheres surrounding the work. With due care in selecting the atmosphere, one can control or prevent oxidation, carburization or decarburization. And as a consequence of establishing proper atmosphere control, expensive cleaning and pickling, also grinding after hardening, can be eliminated.

To use a controlled atmosphere, the furnace equipment must be individually analyzed and designed for the particular application. Atmosphere furnaces are fabricated to be gas-tight. When fuel-fired furnaces are used, radiant tubes or muffles are necessary to keep the products of combustion from mixing with the prepared atmosphere. Other factors permitting, resistor-type electric furnaces may be used without muffles.

Separately controlled atmospheres are now being widely applied to pusher, roller-hearth, box, bell, belt-conveyor and elevator furnaces. The principal heat-treating processes to which controlled atmospheres can be applied are: bright annealing, bright hardening, gas carburizing, furnace brazing and sintering of powder metals.

No Universal Atmosphere

In general, no single atmosphere is universally applicable to all processes. The closest approach to a universal heat-treating atmosphere is completely burned fuel gas, which has high nitrogen content, is oxygen-free, and contains sufficient reducing properties to overcome the effect of impurities from the metal and from furnace brickwork. The equipment necessary to produce this atmosphere is more expensive than that for alternate choices of atmospheres.

General types of controlled atmospheres may be broadly classified as reacted fuel-gas atmospheres, neutral or inert atmospheres, dissociated ammonia atmospheres.

A chart, Fig. 1, shows the range of gas-atmosphere composition when a fuel gas is burned with various amounts of air. The limiting ranges for combusted fuel gas and reacted fuel gas are shown. In general, an inert gas is fuel gas with carbon dioxide and water vapor removed.

The general problem in applying controlled atmospheres to metals usually resolves itself into partial or total prevention of oxidation of the metal surfaces and prevention of metallurgical changes in metal, such as loss of carbon from steel surfaces. In some processes the atmosphere is applied purposely to affect the metal

structure and composition, such as gas carburizing, whereby controlled amounts of carbon are added to the steel surface. Further details are given with respect to processes and materials:

Annealing Nonferrous Metals

Copper may be annealed without oxidation in an atmosphere of steam, but this method allows water staining. In annealing wire, strip and tubing, particularly in finish-annealing, it is preferable to use a separately controlled atmosphere. Shiny, bright surfaces can be obtained by using completely burned fuel gas maintained slightly on the reducing side.

Copper is discolored at elevated temperatures in the presence of extremely small amounts of sulphur compounds, particularly hydrogen sulphide. Manufactured fuel gases, such as coke-oven gas or carbureted water gas, are usually passed through iron-oxide boxes to remove hydrogen sulphide, before being used commerically. Although this scrubbing operation reduces the hydrogen-sulphide content to about 5 grains per 100 cu. ft. of raw gas, even this small amount is sufficient to discolor copper after mixing with air and burning in a gas generator. For this reason, further removal is necessary beyond the gas generator.

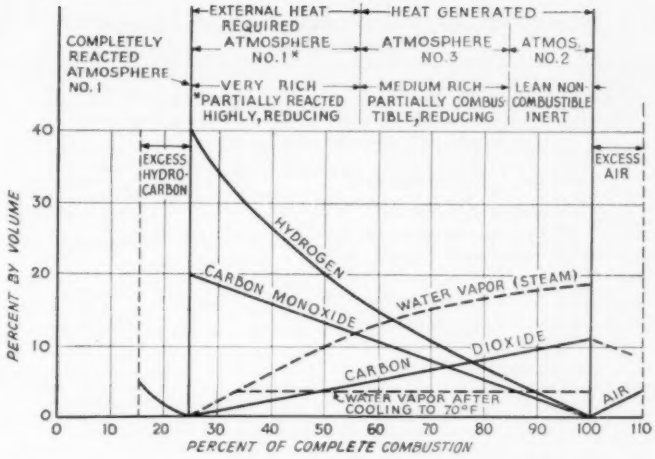


Fig. 1—Composition of fuel gas when chemically combined with air

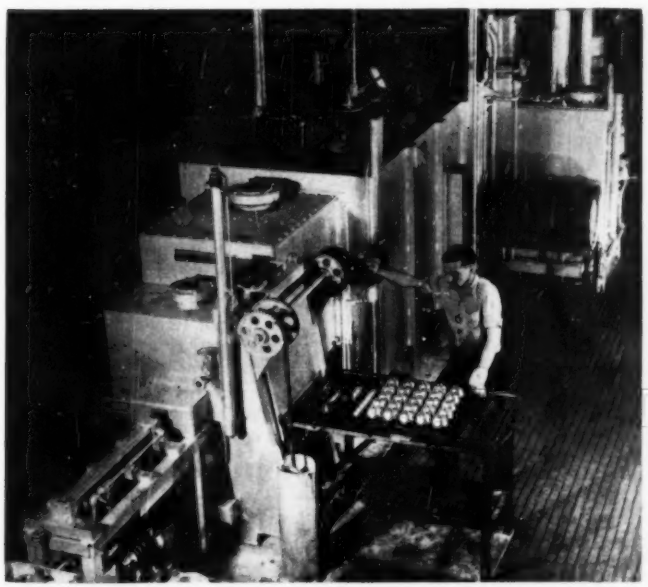
Complete combustion of fuel gases in a generator tends to convert most of the organic and inorganic sulphur content into sulphur dioxide, which is carried off in the condensate. The small amounts of hydrogen sulphide are removed by iron-oxide towers on the exit side of the gas generator.

Certain types of copper contain small amounts of oxygen. This often reacts with hydrogen in the atmosphere and causes embrittlement. In these cases, the atmosphere must be set for a bare minimum of hydrogen and carbon monoxide (about ½ to ¾% of each) without any free oxygen.

Annealing Cu-Ni Alloys

Copper-nickel alloys may be bright-annealed with the same atmosphere as that used for copper. Again, the atmosphere must be entirely free of sulphur. Hydrogen embrittlement usually is not a problem with these alloys, so that atmospheres with higher hydrogen and carbon-monoxide may be used.

Copper-zinc alloys may be clean-annealed with the same atmosphere as used for copper. Bright-annealing is not obtained because zinc volatilizes from the surface of material at elevated temperature. This gives the surface a "clouded" appearance. Volatilization of zinc and subsequent oxidation of the surface of the



Clean hardening of miscellaneous machine parts, as done in a pusher-type furnace with atmosphere control, avoids the need for finish grinding or cleaning after the parts emerge

Table I . . . Composition and Nature of Typical Controlled Atmospheres

ATMOSPHERE	DESCRIPTION	AIR TO GAS RATIO	N_2	H_2	CO	CO_2	CH_4	O_2	DEW-POINT	NATURE OF ATMOSPHERE
No. 1	Completely reacted fuel	2.75:1[a]	41.7	38.0	19.0	0.0	1.3	0.0	—10°F	Most reducing; combustible; toxic
No. 2	Completely burned fuel	10:1[a]	89.0	0.5	0.5	10.0	0.0	0.0	(b)	Slightly reducing; noncombustible
No. 3	Partially cracked fuel	6:1[a]	69.0	15.0	10.0	5.0	1.0	0.0	(b)	Medium reducing; combustible; toxic
No. 4	Scrubbed Atmosphere No. 2	10:1[a]	94.0	3.0	3.0	0.0	0.0	0.0	—50°F	Inert; noncombustible
No. 5	Scrubbed Atmosphere No. 3	6:1[a]	72.0	16.0	11.0	0.0	1.0	0.0	—50°F	Reducing; combustible; toxic
No. 6	Dissociated Ammonia	No air	25.0	75.0	0.0	0.0	0.0	0.0	—60°F	Reducing; combustible
No. 7	No. 6 completely burned	1.88:1[a]	99.0	1.0	0.0	0.0	0.0	0.0	b	Inert; noncombustible
No. 8	No. 6 partially burned	1.25:1[a]	80.0	20.0	0.0	0.0	0.0	0.0	b	Slightly reducing; combustible

[a] Air-to-gas ratios are representative for natural gas containing practically nothing but methane.
[b] Dewpoints correspond to room temperatures unless auxiliary drying equipment is added.
[g] Dissociated ammonia.

metal by carbon dioxide and water vapor in the controlled atmosphere can be greatly retarded by using a high-nitrogen atmosphere from which these constituents have been removed.

Copper-silicon alloys may be bright-annealed in a high nitrogen atmosphere free from carbon dioxide, water vapor, traces of sulphur.

Copper-silver alloys may be bright-annealed with either completely burned or partially burned fuel gas, but the atmosphere must be free of any traces of sulphur, or discoloration will result.

Nickel and Monel metal may be bright-annealed with either completely burned or partially burned fuel gas, but it must be entirely free of sulphur. The metal surfaces, although free of oxide, present a gray or matte finish. Shiny bright surfaces can be obtained by using dissociated ammonia or combusted dissociated ammonia. Inconel can only be bright-annealed with dissociated or combusted dissociated ammonia.

Aluminum and its alloys can be successfully treated in air atmospheres provided the moisture content is relatively low. Completely burned, or partially burned and partially dried, fuel gases can also be used. In this field, there is not yet any widespread use of separately prepared controlled atmospheres since prevention of slight surface oxidation is not a serious problem.

Magnesium can be annealed with combusted fuel gas, which in general avoids active or rapid oxidation, and thus prevents possible combustion of the magnesium at normal heat-treating temperatures. Air atmospheres with ½ to 1% sulphur dioxide added are also used successfully.

Annealing Ferrous Metals

Low-carbon steel may be bright annealed with partially burned fuel gas (the generator being set to give maximum reducing properties). In cases where cooling-water temperature is over 60 F., the dewpoint of the gas atmosphere leaving the generator will be over 70 F. This can cause discoloration of steel, because the excess water vapor oxidizes the steel as it slowly cools from 1100 to 700 F. In cases where cold water is not available the year around, it is necessary to supplement the atmosphere with partial drying to dewpoints of about 40 F.

Partially burned fuel gas is approximately in equilibrium with low-carbon steels at normal annealing temperatures. Hence, there is no measurable amount of carbon loss or gain from the steel, arising from chemical combination with the atmosphere. But this type of atmosphere is definitely decarburizing to medium- and high-carbon steels and to various alloy steels, and should not be used where decarburization cannot be tolerated.

Medium- and high-carbon steels can be bright-annealed with completely burned fuel gas with carbon dioxide and water vapor removed. This atmosphere is practically neutral, so neither carburization nor decarburization takes place. But the small amounts of carbon monoxide and hydrogen present in the atmosphere are sufficient to react with oxidizing impurities on the steel being heated, or impurities from brickwork.

Inert Atmosphere Needed

Long-cycle annealing of alloy carbon steels or high-carbon steels requires an atmosphere that is chemically inert and therefore which does not react with the carbon in the steel. A high nitrogen content and total removal of carbon dioxide and water are necessary to produce an atmosphere that is chemically "neutral". The reaction rate is so small that no measurable carbon gain or loss occurs when steel is heated to annealing temperature and held there for long periods of time.

Alloy carbon steels, tool steels and high-speed steels may be annealed for long cycles without oxidation or decarburization, using completely burned fuel gas with carbon dioxide and water vapor removed. Atmosphere requirements are the same as those just discussed for high-carbon steels.

Stainless steels, including the chromium-nickel-iron alloys, and the chromium-iron alloys, can be annealed without heavy oxidation in completely burned or partially burned fuel gas and with little oxidation in completely burned fuel gas with carbon dioxide and water vapor removed. But, if it is desired to bright-anneal these steels it is necessary to use pure dry hydrogen. Even very small amounts of oxygen cannot be tolerated.

Hardening of Ferrous Metals

Finished machined parts of all sizes and descriptions can be hardened free from oxidation and decarburization. Uniform quality of work on a large production basis can be realized without subjecting the pieces to further machining, grinding, sandblasting, pickling or

other cleaning operations formerly necessary to eliminate scale and soft skin (decarburization) on the work being heat-treated.

The atmosphere required to accomplish bright-hardening without decarburization must be low in carbon dioxide and water vapor. It is possible to produce an atmosphere which has only small residual amounts of carbon dioxide and water vapor by reacting completely the hydrocarbon in the gas to carbon monoxide and hydrogen with a limited amount of air, in the presence of a catalyst at high temperature. Partially reacted fuel gas is suitable for short-cycle (less than 2 hr.) hardening of medium-carbon steels at medium-range hardening temperatures (1400-1450 F.) with no oxidation or decarburization.

Completely reacted fuel gas is suitable for hardening of high-carbon steels and alloy carbon steels without oxidation or decarburization. This gas contains no carbon dioxide and little water vapor, is non-decarburizing to high-carbon steels, and is particularly applicable to hardening where decarburization cannot be tolerated. This gas can also be set so as to be in "carbon balance" with the steel being heat-treated, so that neither carburizing nor decarburizing takes place.

Tool steels and high-speed steels can be hardened without oxidation or decarburization by using completely reacted fuel gas. The high-carbon, high-chromium tool steels can be hardened without decarburization but will be tarnished due to slight oxidation of the chromium. If it is desired to bright-harden these steels, it is necessary to use dissociated ammonia inside a furnace with special alloy muffle.

Gas Carburizing

Gas atmospheres may be created to control the rate at which carbon is added to the steel surface and the distribution and depth of carbon dispersion into the steel. Gases that contain no carbon dioxide or water vapor will not remove carbon from steel, and serve as a "carrier" to which carbon-bearing gases are added. Methane is by far the most efficient carburizing gas; small amounts added to a carrier gas like dissociated ammonia produces an atmosphere suitable for quick, efficient, soot-free carburizing. Due to the presence of

TABLE II . . . Atmospheres Suitable for Heat-Treatment of Different Metals

MATERIAL PROCESSED	PROCESS	TEMPERATURE RANGE DEG. F.	CYCLE TIME (Long if over 2 Hr.)	REQUIRED SURFACE	ATMOSPHERE NO. (See Table I)
Bright or Clean Annealing					
Low-carbon steels	Anneal	1200 to 1350	Long	Bright	3
Medium-carbon steels	Anneal (no decarburization)	1200 to 1450	Long	Bright	4
High-carbon steels	Anneal (no decarburization)	1200 to 1450	Long	Bright	4
Alloy steel, medium- and high-carbon	Anneal (no decarburization)	1300 to 1600	Long	Bright or clean	4
High-speed tool steels, including molybdenum high speeds	Anneal (no decarburization)	1400 to 1600	Long	Bright or clean	4
Stainless steels, chromium and nickel chromium	Anneal	1800 to 2100	Short and Long	Bright	6
High-silicon steel, electrical sheet	Anneal	1900 to 2100	Long	Clean	4 or 6
Copper	Anneal	400 to 1200	Long or Short	Bright	2
Various brasses	Anneal	800 to 1350	Long or Short	Clean	2
Copper-nickel alloys	Annea	800 to 1400	Long or Short	Bright	2 or 4
Silicon copper alloys	Anneal	1200 to 1400	Long or Short	Bright	4
Nickel	Anneal	1600 to 2000	Long or Short	Bright	2 or 6
Automatic Brazing or Sintering Operations					
Low-carbon steels	Copper brazing	2050	Short	Bright	2 or 4
Medium- and high- carbon steels	Copper brazing (no decarburization)	2050	Short	Bright	1 or 4
Alloy steels, medium and high carbon	Copper brazing (no decarburization)	2050	Short	Bright	1 or 4
High-carbon, high-chromium steels	Copper brazing	2050	Short	Bright	6
Stainless steels	Copper brazing	2050	Short	Bright	6
Copper or brass	Phos-copper brazing or silver soldering	1500 to 1600	Short	Bright	2
Bright Hardening and Tempering					
Medium-carbon steels	Hardening	1400 to 1600	Short	Bright or Clean	1
High-carbon steels	Hardening	1400 to 1800	Short	Bright or Clean	1
Alloy steels, medium- and high-carbon	Hardening	1400 to 1800	Short	Bright or Clean	1
High-speed tool steels, including molybdenum	Hardening	1800 to 2400	Short	Bright or Clean	1
All classes of ferrous metals	Tempering or drawing	400 to 1200	Short	Bright or Clean	2

carbon monoxide, hydrogen and residual methane in scrubbed, lean, burned fuel gas, it already possesses a reasonable carburization "potential" and the addition of one or two per cent of methane gives a very active gas for carburizing.

Atmosphere Furnace Brazing

Many nonferrous metals can be brazed in protective furnace atmospheres. Completely burned fuel gas is suitable for many of these applications. If discoloration is to be prevented, all traces of sulphur in the gas must be removed, as in the case of bright-annealing of copper. Richer gas atmospheres with higher reducing properties are suitable if hydrogen embrittlement is not a factor.

Brazing of steels with copper at 2050 F. is widely used; silver brazing 1700-1800 F. is finding growing applications. In both instances reducing atmospheres are required. Partially burned fuel gas is applicable when the brazing does not require prevention of decarburization. This is not a problem on low-carbon steels but may be a factor with medium- and high-carbon steels. Although the average brazing operation requires only a relatively short time at high temperature, decarburization proceeds rapidly when carbon dioxide and water vapor are present.

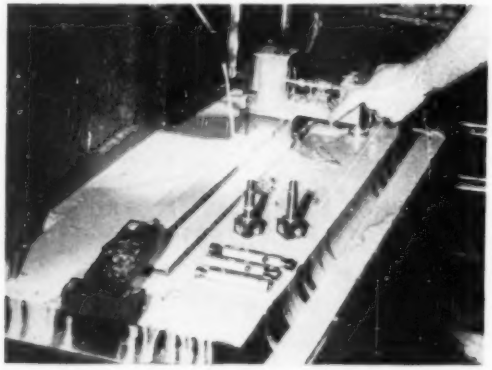
To prevent decarburization of brazed work, use partially burned or completely reacted fuel gas. Completely reacted fuel gas is particularly suitable for brazing because of high hydrogen and carbon monoxide content.

Stainless steels and the high-chromium steels require a pure reducing atmosphere. Atmosphere No. 5 is the most suitable, or dry, pure hydrogen can be used.

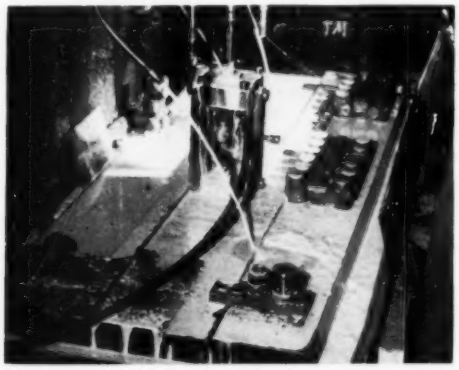
Sintering or Powder-Metallurgy Applications

Controlled atmospheres are necessary in the production of metal and alloys in this rapidly growing field. Brasses, bronzes and similar materials are sintered with reducing atmospheres, like partially or completely reacted fuel gases.

Ferrous alloys and iron, in general, utilize the same atmospheres. As in normal ferrous metallurgy there are cases where decarburization must be prevented. Fuel-gas atmospheres, low in carbon dioxide and water vapor, are then desirable.



Inverted T-section rail aligns clamping jig for taper-drilling and taper-tapping operations in steel swivel body for hose reel. If cutting tools have a lifting action, longitudinal keyways cut in the vertical surfaces of the rail are engaged by keys set in grooves in the jig



Two long bars guide heavy jig in simple aligning setup. These are clamped to the table to position the jig under three spindles in turn for drilling, reaming and counterboring a cast-iron valve body. Hose connected to jig delivers coolant directly against work inside jig

GUIDE RAILS SPEED JIG ALIGNMENT

BY BEN C. BROSHEER, Associate Editor

FREQUENTLY parts must be located in a jig and moved from spindle to spindle on a multiple-spindle drillpress for a combination of drilling, counterboring, countersinking and tapping in the same hole. Accurate alignment of the spindles with the guide bushing in the jig is essential.

This problem has been solved in Stewart-Warner's light-machining department by inexpensive guide rails along which the jig or fixture can be moved for positioning. Two CRS bars form the simplest of two types of guides. These are aligned so the jig will slide between them parallel to the line of spindles. Initial setups are made by aligning the jig under an end spindle, with the bushing centered; then clamping the bars parallel. In some cases positive stops are set at the ends of the rails to locate the jig in two directions for the first and last operations.

An inverted T-section forms the second, more expensive rail type. A 1½- by ⅝-in. bar is clamped onto a 4-in. bar and these are centered under the spindles. A mating groove is cut in the bottom of the jig, which rides along the rail.

WHY TAPER THREADS DON'T FIT

From years of experience with rotary tool joints, the author says that accurate gages do not insure interchangeable pins and boxes. While offering no solution, he does outline possible errors in taper-threaded products

BY W. E. BURNDRETT

IN THE processing of rotary tool joint connections and kindred taper-threaded products for the oil industry, many manufacturers and field service shops experience difficulty in maintaining their standards and controlling interchangeability.

The majority of these connections have relatively long threads; some serve in a dual capacity, acting as power-transmission units as well as pressure connections.

The severe operating conditions imposed on these products, together with the need for absolute interchangeability, at times present problems to those engaged in their manufacture.

The manufacturing problems may be stated as:

1. Components do not assemble as predicted by gaging.

2. Apparently identical gages give varying results, causing interdepartmental confusion and added cost.

3. Re-gaging of the product by the customer or his inspection agent does not always agree with that of the vendor.

Items 2 and 3 are somewhat synonymous, but differ in that the former is intended to refer to conditions within an organization and admittedly will not be evident where dual equipment is not present. The latter concerns the variation between different manufacturers and will affect interchangeability.

In analyzing this situation, it is well to consider first the gaging practice for straight threads. This background may help to convey the fundamental difference between gaging straight and taper threads.

When gaging straight threads, a GO and a NOT-GO gage are used. This dual-gage system is designed to facilitate rejection of parts having errors in the individual thread elements, sufficient to result in deviation of the pitch diameter beyond specified limits.

For example, a 1" - 14-N F - 4 part with a plus 0.003 in. lead error per inch would necessarily have a pitch-diameter deviation sufficient to permit the GO gage to pass. This deviation would also allow the NOT GO gage to go on, resulting in rejection.

Therefore, this gaging system for straight threads controls to some extent the variables in thread elements within set limits, and avoids accepting parts that exceed allowable collective errors.

When gaging taper-threaded connections, on the other hand, only one gage is employed, and it is used both as a GO and a NOT GO gage.

The size of tapered threads is therefore determined by projection of the one gage with respect to some datum plane. On rotary tool joints it is usually the shoulder of the "pin" and the face of the "box". It is this "stand-off" of the gage, within limits, that controls the size of the part. A box connection with an excess minus stand-off will require facing to bring it within the established gaging tolerance. Likewise, a pin having a plus stand-off will require further milling or chasing to correct its size.

It must be emphasized that gaging of tapered threads is done with all the inherent errors in the thread elements, even though they may be within the specified limits.

The variations in gage stand-off that can result from errors in taper, lead and thread form, either individually or collectively, are surprising, and more so when it is realized that the initial errors are amplified by geometric factors.

Consider first the effect of taper alone as one of the contributing causes of the discrepancies.

The amount of axial travel that results from a unit change in diameter is illustrated in Fig. 1, together with the ratios of axial travel to diameter change for the customary tapers used.

These data are doubtless familiar, especially to

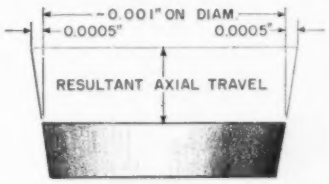


Fig. 1..Small changes in pitch diameter of a taper-threaded product produce large changes in axial travel and hence corresponding variations in gage stand-off. Figures for customary tapers are:

TAPER PER FT.	PITCH DIAMETER VARIATION, IN.	AXIAL TRAVEL, IN.
2 in.	0.001	0.006
3 in.	0.001	0.004
¾ in.	0.001	0.016
⅜ in.	0.001	0.032
8°	0.001	0.0036

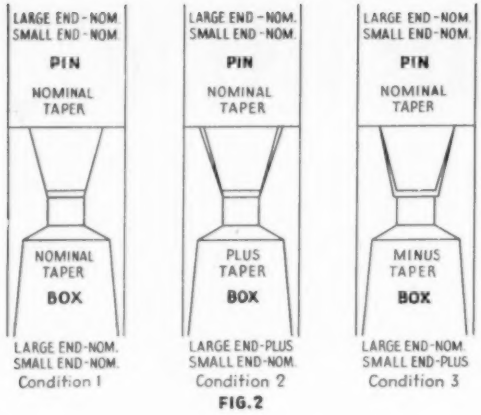


FIG.2

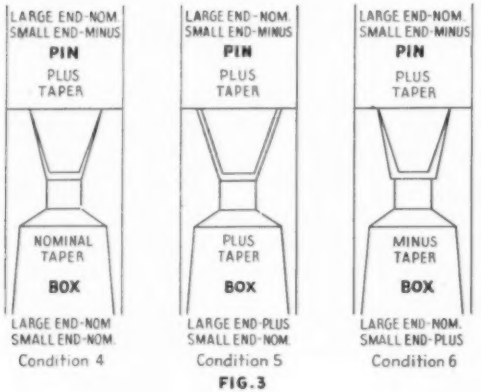


FIG.3

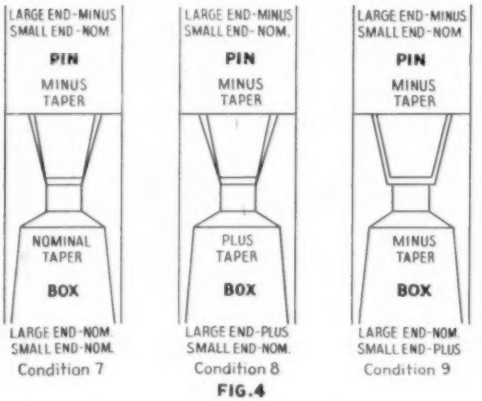


FIG.4

Figs. 2 to 4.. Nine possible combinations of fit are possible with pins and boxes, because product tapers vary plus or minus from nominal; two are loose fits, the others are shoulder fits and contact is achieved either at the small or large end

those who work with tapers. But it is questioned whether the amount of axial travel resulting from relatively small deviations in pitch diameter is thoroughly appreciated in the case of taper threads.

Those engaged in manufacture and maintenance of rotary tool joint threads will admit that product tapers will vary both plus and minus from nominal, even though effort is made to control the tolerance in one direction only. In making this assumption, it follows that a diversity of fits will result, Figs. 2 to 4, in everyday operation. These illustrations are necessarily exaggerated for the purpose of showing the various conditions that may be encountered.

It will be seen that there are nine possible combinations, but only two of them result in a loose fit. This occurs with pins and boxes having identical taper errors: condition 5, where both members have a plus taper, also condition 9, where both members have a minus taper. The remaining conditions have a shoulder fit, the same as gaging predicts (that is, assuming zero gage errors), but their contact is either at the small or large end only, according to the direction of the taper errors.

The amount of radial shake of the two loose connections depends on the degree of differential diameters, and the corresponding axial travel will be a function of the radial clearance and the ratio of the tapers involved.

No cognizance will be made with respect to the relative merits of the load-carrying capacities of the various fits as revealed by this analysis. This article attempts only to deal with the effect of dimensional variables on gaging and the interchange fit and does not presume upon engineering prerogatives.

Lead-Error Tolerances

Lead error produces a rapid change in pitch diameter. In the absence of definite specifications on the individual elements of the threads, the industry units have adopted individual tolerances commensurate with availability of tools and reasonable manufacturing costs. Lead error is therefore generally held to ± 0.001 in. per in., with a cumulative restriction of ± 0.003 in. for total length of thread.

This practice excludes incidental or periodic errors sometimes encountered, and assumes only a uniformly progressive lead error. It is realized that actually the pitch-diameter change is the same for identical errors between adjacent threads, as for those occurring in the over-all engaged length.

If then a product is assumed to have a maximum lead error of 0.003 in. in one direction, then the effective pitch diameter change, in order to make the gage fit correctly, would be 0.0052 in. If the taper were 2 in. per ft., then the axial travel resulting from this lead error would be 0.0311 in. Similarly, if the taper were 3 in. per ft. with the same lead error, then the travel would be only 0.0207 in. These figures are for lead error in one direction only and would of course be twice the

amount for the total error between products with opposite lead errors.

These amounts seem rather high, but they cannot be denied, and they serve to illustrate the pyramiding effect of element error. It is conceded that in everyday operation, taper errors in a certain direction tend to neutralize this maximum discrepancy. But they account for connections frequently found with excessive stand-off, contrary to that expected from gaging, even though the products are within established limits for this element.

Flank angle of the thread requires consideration. No attempt will be made here to evaluate the axial differentials resulting from flank variables, particularly in view of the relatively complex conditions when pins and boxes are assembled.

The tolerance used on the flank angle is about the same as generally used for commercial threads, that is, ± 30 min. Three possible angles per flank will therefore result, with six combinations per member. It follows, then, that as pins and boxes engage in assembly there is a possibility of 36 different combinations.

Where Maximum Interference Occurs

The nominal conditions will naturally have no interference, as will all cases where the errors are uniformly in the same direction. Maximum interference results where flank errors are in the maximum opposite directions; that is, when one member with all flanks on the maximum plus side is coupled with the other member having flanks on the maximum minus side. Such behavior may be visualized from Fig. 5.

It is realized that the same condition prevails with straight threads but not to the same extent because the amplifying effect of taper to pitch diameter is not present.

Proper thread truncation and root clearance are also of paramount importance. While deviations in these elements cannot correctly be considered a cumulative error, there are many instances on record of interference between product pins and boxes at assembly, where the gaging was apparently correct. Because of this fact it is felt that the subject should be discussed.

Cases of this kind probably arise from negligence or inexperience. Such incidents occur when the threads are too "thin," resulting in reduced crest widths and in widened roots by a corresponding amount. In assembly, the crest corners of one member will contact the root radius of the mating member, leaving the flanks open.

This discrepancy will not be detected by regular thread plug and ring gages, since they are usually truncated a greater amount than the product threads, and the roots are "cleared," so that gaging is done on the thread flanks as intended.

This is one situation where the product fit is actually greater than that predicted by gaging. In most cases the fits are considerably looser than expected from gaging.

The obvious method of avoiding crest and root

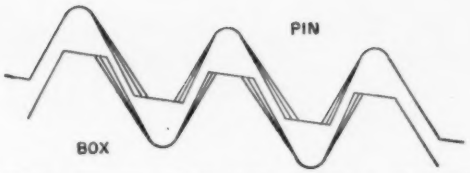


Fig. 5.. With three flank angles possible on pins and boxes, up to 36 combinations can result, and maximum interference occurs when flank errors are in maximum opposite directions

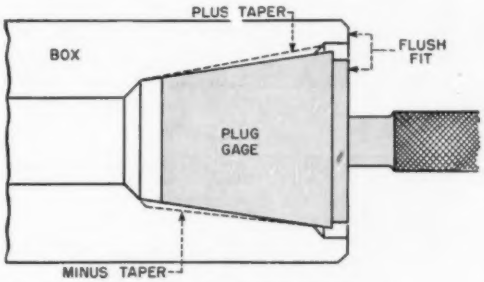


Fig. 6.. How taper of box affects gaging: plus taper—the small end controls; minus taper—large end controls

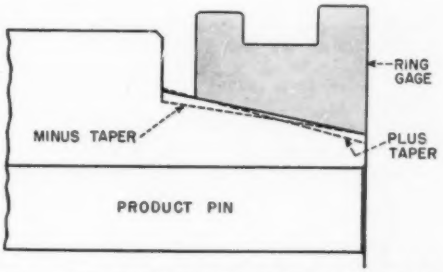


Fig. 7.. Taper variations affect gaging of the pin in a manner opposite to that of the box

interference is by use of form pitch or profile gages prior to the regular thread gages. But as stated previously, this condition can be avoided if precautions are taken in the initial set-up, where deviations of such magnitude can be easily detected.

So far, the effects of errors in individual elements have been considered. The next step is to evaluate what happens when all of the elements are gaged collectively.

The A.P.I. taper thread gages are of the solid type, and have been called the "physical representation of a theoretical dimension." As such, these gages check only the cumulative effect of all deviations from nominal. The amount of deviation of a given element determines the actual position of the gage on the product. And physical contact of points of similar dimensional characteristics establishes the size of the part.

What are these gaging conditions? Fig. 6 shows a

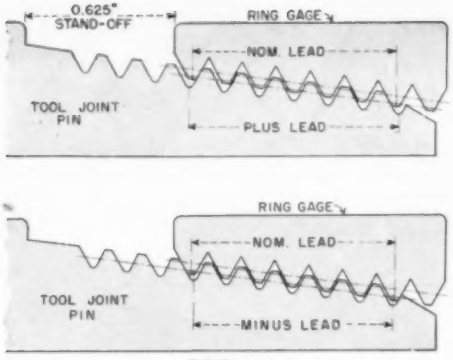


FIG. 8

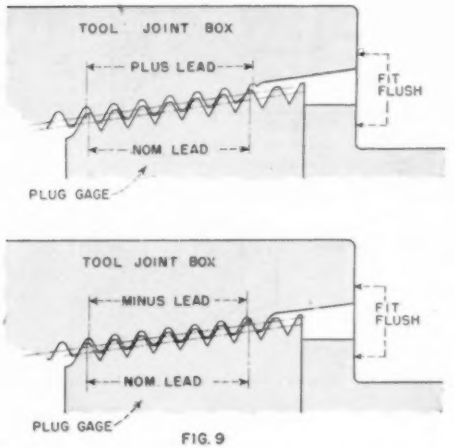


FIG. 9

Figs. 8 and 9.. Poor thread contact results from plus and minus lead errors on pins and boxes

having a plus taper, the size is controlled by the small end, the large end being plus on the diameter as a result of the plus taper. If the taper error is in a minus direction, then the large end will establish the size, leaving the small end plus on the diameter.

These conditions are reversed when gaging the pin, Fig. 7. A plus taper results in the large end sizing the part; with a minus taper, the small end controls the size.

Since all wear on plug and ring gages is in a plus direction, gage-wear errors will ultimately affect the interchangeable fit of the product. Wear of the taper introduces additional errors, some of which offset each other while others accumulate, according to the direction of taper in the product.

Gage wear is not readily apparent from periodic mating or interchange tests with the masters. Their relative size by this procedure is governed by the same factors that affect product gaging.

Figs. 8 and 9 show the gaging of two pins and boxes, one of each having a plus lead error, and the other a corresponding minus amount. To make the gages fit correctly, the pitch diameters on the pins are reduced the same amount for both the plus and minus leads, while those of the boxes are increased a like amount for comparable lead errors.

But there is a distinct difference between these plus and minus lead products in that the thread contact of the gage and the part is on opposite flanks. The illustrations show that contact takes place on the opposite outer flanks when the lead error is plus while on the slow or minus leads the opposite inner flanks are in contact. All threads between these two are open.

When products of opposite lead error are mated, Fig. 10, only two threads carry the load. In some instances the dimensional errors may be so small that at assembly plastic deformation will take place under load and so bring the other threads in contact. But this is just one of the many reasons why some products having been subjected to appreciable torque at assembly will have their threads distorted, and will not re-gage as they did originally.

Loose Shoulder Fits Result

If, on the other hand, the lead errors are in the same direction, the fit will be like that illustrated in Fig. 11. Here, position of the pin with respect to the box is shown at the instant the shoulders contact, the axial thrust being on the front flanks. This condition is termed a "loose shoulder fit." All threads are in contact, since their leads are identical, but flank contact is appreciably reduced.

The differential pitch diameters are obvious, but the pin is restricted from further axial advancement by the shoulder. Radial motion is still possible, so by continued rotation of the pin, the direction of the thrust will be changed from the front flank to the rear as the joint tightens against the shoulders.

Fig. 12 is an enlarged sectional view of a "loose fit" assembly, illustrating the high ratio of axial travel with appreciable difference in pitch diameters. The amount of axial travel equals the amount to be faced off the combined pin and box shoulders in order to make the actual fit theoretically correct. Obviously such a procedure results in parts being

TABLE I

AXIAL TRAVEL FROM THREAD ELEMENT TOLERANCES—API GAGES

THREAD ELEMENT	DIMENSIONAL VARIATION ALLOWED	TOTAL TOLERANCE	RESULTANT AXIAL TRAVEL
Pitch Diameter	0.0004 in.	0.0008 in.	0.0048 in.
Lead	0.0004 in.	0.0008 in.	0.0083 in.
Thread Angle	07 min.	14 min.	0.0015 in.
Total			0.146 in.

out of the specified limits when gages are applied.

To simplify this analysis, it has been assumed thus far that no errors exist in the gages. But tolerances are necessary for gages, even though appreciably smaller than product tolerances. Gage tolerances ultimately affect gaging results and produce discrepancies in interchangeable fits for much the same reasons as outlined for the products. This is true because the tolerances permitted by the A.P.I. on the individaul thread elements for gages far exceed the mating and interchangeable fit restrictions. Table I gives figures for the corresponding axial travel resulting from each element tolerance.

No gage manufacturer can take advantage of all the permissible tolerances and still maintain the qualifying "Step-value" restriction, not to mention the added requirement of the interchange of any plug with any ring within ± 0.004 in. It is only by controlling the elements considerably within these limits that gages are produced to meet these rigid requirements.

The A.P.I. Grand Master Gage represents the most accurate gage that can be produced and necessarily has a minimum of errors. Even so, it is still difficult to reproduce identical mating fits even with the use of "torque hammers," and although the differences are relatively small they do add to the total.

The Grand and Regional Masters are required to meet a mating and interchange fit of ± .001 on step-value. The Plant Masters carry the same stipulation initially, but are permitted an additional tolerance for re-calibration of ± 0.004 in.

Discrepancies in Gage Setup

The interchange tests of these gages are progressive from the Grand Master down to the Working Gages. Thus, errors are possible if the Working Gages were to be calibrated against the Grand Master, which of course is not possible. The sequence is given in Table II, from which it will be apparent how descrepancies may creep into the gage setup.

It will be seen that there is definite possibility of an 0.008 in. difference between two working gages, excluding any variables in the other gages. Experience demonstrates that such errors exist and will have some effect on the working gages. This one fact alone sheds light on why products will not meet gaging requirements when inspected with another set of gages, even when gage wear is excluded.

TABLE II

INTERCHANGE FITS THAT LEAD TO WORKING-GAGE DIFFERENCES

	ORIGINAL MATING FIT	RE-CALIBRATION FIT	INTERCHANGE FIT
Grand Master	0.001 in.	0.001 in.	
Regional Master	0.001 in.	0.001 in.	0.001 in.
Plant Master	0.001 in.	0.004 in.	0.004 in.
Working Gage	0.004 in.	0.004 in.	0.004 in.
Probable Max. Difference			0.018 in.
Definite Max. Difference			0.008 in.

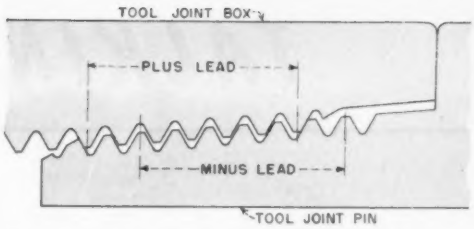


Fig. 10.. Opposite lead errors may set up the condition where only two or three threads carry the load

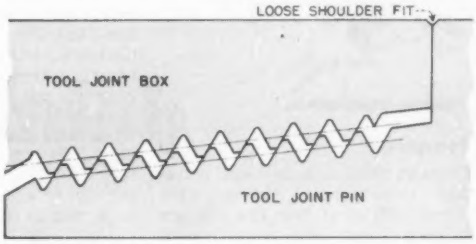


Fig. 11.. With lead errors in the same direction, a "loose shoulder fit" results, meaning that axial thrust is on the front flanks as the shoulders of pin and box contact

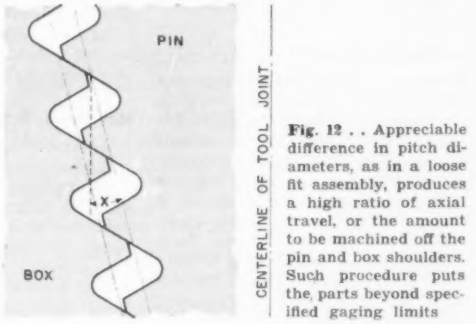


Fig. 12 . . Appreciable difference in pitch diameters, as in a loose fit assembly, produces a high ratio of axial travel, or the amount to be machined off the pin and box shoulders. Such procedure puts the parts beyond specified gaging limits

Reduce Element Errors

The purpose of this article is to show that control of size and interchangeability of taper-threaded products is not as simple as gaging other types of products. Because of geometric features of this design, even perfect gages will not of themselves guarantee the accuracy of the parts, and inherent element errors contribute to varying results. No solution can be offered to relieve this problem, except to stress the necessity for trying to reduce errors in individual elements, with particular emphasis on the lead, and to exert more vigilance over each phase of manufacture and particularly on gages in order to reduce the variable to a minimum.

TALKING SHOP

Ponypower

CURRENT OVERLOADS on most industrial power-supply systems have forced utilities to drop line voltages in many cases. Thus portable tools and other units that depend for their punch on 110-115 volts may not have anything like that at times. This may explain why some of your horsepower may at times act like ponypower.

Cutting by Coolant

SAWING OF STONE has changed but little in recent decades. Norton Pike Company, Littleton, N. H., a division of Norton Company, produces natural-stone oilstones, slips (for honing carving-tool edges) and abrasive sticks, as well as formed shapes of silicon carbide and aluminum oxide. "Pike" still makes oilstones from Arkansas novaculite (a form of flint) and Ohio bluestone (called "Washita"). Chunks of the stone are packed like a rubble wall into a truck and the interstices filled with plaster to make a 4-ft. cube. The truck is rolled under the "saw", really a frame holding bands of 0.30-carbon steel about 3/32 in. thick and 3 in. wide. The frame is reciprocated by a crank driven by a 7½-hp. motor through a heavy shaft and flywheel. Cutting is done by a continuously pumped slurry of aluminum oxide and water. These steel bands are soft enough to catch the abrasive grains, hard enough to give good service life. One cut takes 2 or 3 days in bluestone, as many weeks in hard Arkansas.

First cuts make 2-in. slabs, second cuts reduce these to 1x2-in. sections. Pieces are cut by hand with heavy chisels into 8, 7, 6, 5, 4 or 3-in. lengths. Brittleness of the stone and polyglot shape of the raw material result in high wastage—as much as 65% with the hard Arkansas. Oilstones are lapped on all sides on an 8-ft. diameter cast-iron lapping wheel. Pencils, "files" and special small shapes are cut with diamond wheels and similarly lapped. A finished 8x2x1-in. oilstone of hard Arkansas is worth about $10, is used by ivory engravers and carvers, dentists, surgeons, and watchmakers for honing tools. Soft Arkansas handles patternmaking and woodworking tools. Shaped pencils and points are used by engravers and die sinkers to take out burr or wire edge from precision tools, wheels to edge the tools mentioned above. Washita stone, cheaper to buy but coarser, handles honing of common woodworking tools.

A recent Latin-American request was for Washita hones with holes, so the natives who use them on machetes could wear them. These holes and those in oilstone wheels are cut with a brass or steel cylinder in a water-and-abrasive bath.

Not Good, But Pretty

A MAKER of transmission gears for midget racing cars recently inquired about a process to give a special finish. We asked about accuracy. He explained that drivers of such cars never check accuracy, but insist upon appearance. "Given a choice between a pretty gear with 0.014-in. eccentricity, and a dull gear that's right on the nose, they'll always pick the pretty one," he explains. As superstitious as jockeys.

Daffynitions

JURY—12 men who decide which litigant has the better lawyer . . . INTUITION—woman's ability to read between the lyings . . . RUDE MAN—one who stares at what a woman is doing her best to display . . . COURTSHIP—period during which the girl decides whether she can do better . . . MARRIAGE—a mutual partnership, with the husband as the mute . . . HEAVEN—Methuselah's age with Solomon's wives . . . NIGHT-CLUB DANCING—lifting your eyebrows to music . . . SEX—the poor man's polo . . . SYNONYM—the word you use when you can't pronounce the right one.

Continuous X-ray

LATEST DEVELOPMENT in gaging is a continuous X-ray inspection machine developed by Sheffield for Republic Steel. This is used on the hot strip mill and provides an extremely accurate check during rolling. As the stock passes over the X-ray eye, any variation from the predetermined setting is instantly signalled to the operator to enable him to make the necessary corrections.

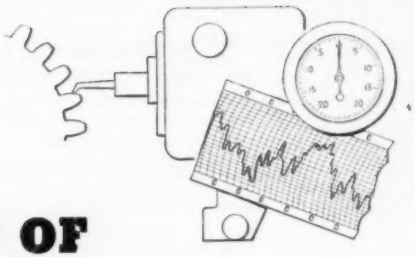
Tension Eases

DISCUSSING recent cooperativeness of local unions, one executive said: "Men in the shop, whom I've known and worked with for 30 years, now dare to speak to me again. For years they've been afraid to—because of criticism from union stewards."

Broken Shot

BROKEN SHOT may actually help in shot blasting, but it is unnecessarily costly in shot peening, according to John Straub of American Wheelabrators & Equipment Co. at the AGMA meeting in Chicago. In one test, sets of ten ½-in plates were treated in various ways, then given fatigue-bend tests. Non-peened plates stood 50,000 cycles. Plates peened to 0.010 arc height with coverage of over 100% with broken shot stood 130,000 cycles, while plates peened similarly with whole shot stood 270,000 cycles. Separation of broken shot can and should be done, says Mr. Straub.

Too much shot peening also costs too much and may even raise internal tension in a piece so high that fatigue life of the peened piece is cut instead of increased. There is a point of diminishing returns on each job, beyond which you're just spending money.



PRACTICAL APPLICATION OF Surface Finish

By GEORG SCHLESINGER, Dr. Ing. (London)

An excellent review of existing methods for measuring surface finish was given in the Special Reports entitled "How Smooth Is Smooth?", Parts I and II, by Ben C. Brosheer. To supplement these reports I should like to present the results of shop experience with tracer-type, or stylus, instruments over the period from 1939-1948. Tests were made to determine surface quality as the criterion for tool sharpness on diamond turning, precision boring, grinding, honing, lapping and gear cutting. Examples illustrated in detail refer to analyses of gear-tooth profiles as produced by the several available processes, also the finishing of pistons and liners for air compressors, diamond boring a bushing and turning railway wheels.

From these ten years of effort to correlate surface-finish values with the capabilities of various machining processes and with assembly and service requirements, my impressions may be summarized thus:

1. Existing surface-finish standards are woefully lacking in that they do not contain all necessary instructions for design, shop and assembly departments.

2. The grade of surface finish to be applied to specific parts must be ascertained by measurement of sample components, which are subsequently given suitable running-in or service tests.

3. With the desirable surface finish known, it is then possible to specify the appropriate finishing processes, because suggested limits for surface-finish values that may be produced with various machine tools, using sharp tools, have been compiled.

4. As between roughness and waviness, the latter is always detrimental and is caused by wrong tool shape, excessive overhang, or lack of rigidity in workpiece or its clamping, and not by characteristics of a modern machine tool in good condition.

5. Surface-finish requirements and selection of manufacturing methods should be the responsibility of the engineer. To avoid mistakes and misunderstandings in the drafting office and shop, there should also be a liaison engineer, thoroughly familiar with shop practice, to work between the designer and the shop man.

A discussion upon which these conclusions rest and details of shop tests are given on the following pages.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

Copyright 1949 by McGraw-Hill Publishing Co., 330 W. 42nd St., New York 18, N. Y.

Practical Application of Surface Finish

IN ITS application to finishing operations—fine turning and boring, grinding, honing, lapping and Superfinishing—surface-finish measurement may be used as the chief criterion of satisfactory functioning of machine-finished parts. I refer to parts that will require no hand work.

To use surface-finish analysis for practical workshop control the following conditions must be fulfilled:

1. Complete collaboration must be established between designer, workshop and inspection department.

2. Interchangeability of parts must be secured (if possible on a non-selective basis) plus immediate functioning of machine-finished mating components without further hand finishing.

Prerequisites to Condition 1

Collaboration between the three departments is indispensable because:

(a) The designer decides which kind of surface quality and which type of manufacturing machine should be used before the work is begun, by putting symbols on the drawing.

(b) The shop follows the directions inserted in the drawing of the single component.

(c) The inspector checks surface quality of work and the use of the correct machining process, according to drawing instructions, but also gives constructive opinions on improvements.

Prerequisites to Condition 2

If prerequisites 1*a*,*b*,*c* are achieved, automatic proof is furnished by ability of the assembly department to put mating parts together according to the prescribed fit (running, transition or interference fit), and to secure satisfactory tests of function, according to requirements:

(*a*) To obtain running fits for low- or high-speed operation without warming-up excessively, or showing vibration, inadmissible noise or wear.

(b) To obtain transition fits that are characterized by repeated assembly without damaging the surface or loosening the grip of the push or the keying fits.

(c) To obtain interference fits that work under similar but harder conditions than the transition fits.

A "standard" on surface qualities should contain all necessary instructions for the three cooperating departments. It is regrettable that a workable standard has not been published in the United States or Great Britain.

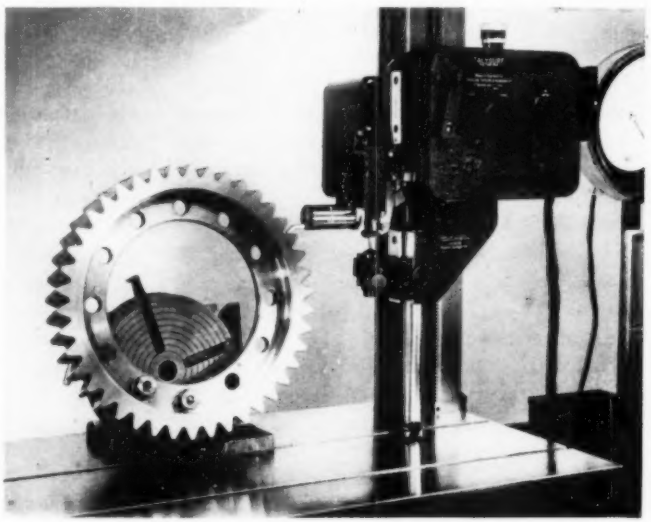
True, the American Standards Association published ASA B46.1-1947 on "Surface Roughness, Waviness and Lay-I" a condensed discussion of a complex subject. This standard covers: (1) Definitions, (2) specification and rating, (3) measurement or evaluation, (4) recommended values of roughness and waviness, and (5) surface symbols.

And then ASA B46.1-1947 says: "This standard does not define what degrees of surface roughness and waviness, or what type of lay are suitable for any specific purpose."

Moreover, the standard does not specify the means by which any degree of such irregularities may be obtained or produced, nor define the means, procedure or apparatus for measurement of the roughness or waviness of the surface defined. Further, the standard is not concerned with other surface qualities such as luster, appearance, color, corrosion resistance, wear resistance, hardness, microstructure, absorption characteristics, etc., any of which may be the governing consideration in specific applications.

Although the height, width, length, shape and direction of surface irregularities may all be of practical importance in specific applications, this standard deals only with their height (roughness), width (waviness) and direction (lay).

The American Standard, there-



All pen records and average readings for roughness of gear-teeth involutes and flanks were made with a "Talysurf" instrument equipped with a radius attachment and skidless pickup

Table I . . ALLOCATION OF PROCESSES TO SURFACE-ROUGHNESS TOLERANCES

MACHINING OPERATION	MICRO-INCHES h_{ave}
Rough turning	64 to 250
Finish turning (rigid lathe)	32.1 to 63
Fine turning:	
1. Ferrous metals	16.1 to 32
2. Non-ferrous metals with	
(a) Carbide tools	4.1 to 16
(b) Diamond tools	1.1 to 8
Commercial boring (boring bar)	16.1 to 32
Fine boring (and reaming):	
1. Ferrous metals	8.1 to 16
2. Non-ferrous metals	
(a) Carbide tools	4.1 to 8
(b) Diamond tools	0.5 to 4
Commercial grinding (unhardened and hardened pieces)	16.1 to 32
Fine grinding:	
First-class	4.1 to 8
Second-class	8.1 to 16
Superfine grinding:	
1. Masters, ordinary gages	1.1 to 4
2. Slip gages	0.5 to 2

MACHINING OPERATION	MICRO-INCHES h_{ave}
Surfaces refined by abrasives (hardened and unhardened)	
1. Lapping	0.5 to 2
2. Honing	0.5 to 8
3. Superfinishing	0.5 to 4
Milling:	
(a) Commercial	32.1 to 63
(b) Fine	16.1 to 32
Planing	
(a) Commercial	16.1 to 63
(b) Fine	8.1 to 16
Reaming	
(a) Commercial	16.1 to 32
(b) Fine	4.1 to 16
Broaching	
(a) Commercial	16.1 to 32
(b) Fine	4.1 to 16
Gear Cutting	
Rotary milling (around involute)	32.1 to 63
Hobbing (around involute)	16.1 to 32
Shaving (around involute)	16.1 to 32
Shaping, planing (around involute)	16.1 to 63
Grinding (generating) (around involute)	16.1 to 32
Form grinding	8.1 to 16
Lapping	4.1 to 8

fore, is not, for practical purposes, a workable specification, but is merely a compromise of obviously widely differing opinions. No working instructions are given, only short definitions of three criteria (roughness, waviness and lay), leaving specification and identification of a surface for a definite application to a great expert.

Finally, the greater portion of the American Standard is devoted to the symbols to be inscribed on the drawings by the designer. One may ask:

Where are the experts in drawing offices with sufficient knowledge and experience to decide which roughness between ¼ and 16 micro-inches should be chosen for a spindle bearing, a piston and cylinder, etc.? Where are data to guide the designer in such decisions or to help the operators of grinding, honing, lapping and Superfinishing machines to distinguish between fine and rough, even and wavy?

The American standard enumerates roughness height values (R.M.S.) micro-inches as:

¼ ½ 1 2 3 4
5 6 8 10 13 16

I should like to meet the shop executive or inspector who is able to distinguish between ¼ to 1, or 2 to 6, or 10 to 16, particularly since there is always variation in roughness within these steps on the same surface but on different spots. Such figures are meter-readings; that is, "all-in" figures, measured as average deviation from the mean surface (the centerline) in R.M.S. or average (arithmetical) values, and these are practically the same.

Numeric values of this kind can be based only on empirical experience. There is no reliable means for using such figures other than to select sample components for all important functions, measure the surface finish, and correlate said surface-finish measurements with parts that pass a suitable running-in test. If this procedure is followed, and the results correlated for several leading plants known for good workmanship, a reliable basis is obtained for standards[1] that combine the different machining operations with the grade of surface available, Table I. Then the designer must insert the symbols that designate degree of permissible roughness, the machining process to be used, and the process of machining should be in the direction in which the inspector should measure surface roughness.

The questionable method of developing standards from theoretical values was applied 50 years ago to settle the question of "Limits and Fits for Engineering." And today one may question whether true dimensional interchangeability of parts is secured (considering reports on "interchangeable" ammunition parts manufactured in the U.K. and the U.S.A.).

The writer had actual shop tests made from 1939 to 1944 to deter-

[1] G. Schlesinger—"Report on Surface Finish", 1942—Published by the Inst. of Production Engineers, London and the American Society of Mechanical Engineers, New York.

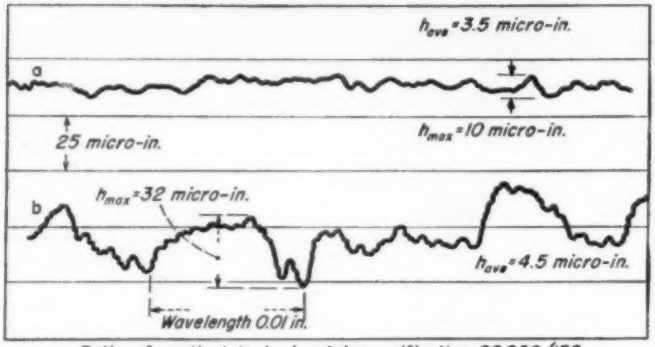


Fig. 1.. Two surfaces, *a* and *b*, may have about the same roughness (3.5 and 4.5 mu.-in., respectively), but surface *a* is even and useful, surface *b* is wavy and is useless for the intended purpose, unless the waves can be removed by further finishing, which it is desirable to avoid

mine surface quality as the criterion for tool sharpness on fine turning and boring and grinding operations. This work was carried out in the Research Department of the Institution of Production Engineers, England. Results were compared with other operations (ordinary turning, boring, shaping, planing, milling and honing) by checking about 500 surfaces of parts accepted by 20 British manufacturers of airplanes, automobiles, trucks, machine tools, instruments, gages, etc.

Further tests were conducted under my direction until 1948. These were controlled according to Table I to finishes listed in the then Proposed American Standard ASA B46-1940, but beginning with 0.5 mu. in. and ending with 32 mu. in., as follows:

0.5-1; 1.1-2; 2.1-4; 4.1-8; 8.1-16; 16.1-32

These steps were accepted and used provisionally in Great Britain and I believe they are very practicable. We tried for instance to begin with 8 mu. in. on a good surface grinder and stopped when the measured surface finish deteriorated to 16 mu. in., when it was assumed that the wheel had dulled by glazing. In fact, condition of the wheel was always inspected after ten passes. Then the wheel was dressed, until a surface finish of 8 mu.-in. was again attained.

This system was used with complete success to learn the influence of kind and dilution of soluble oils upon grinding operations; also of light cutting oils upon drilling and milling (gear cutting) operations.

Obviously, in these tests the increasing roughness of the checked surfaces of test specimens indicates progressive dulling of the tool edge, and at the same time indicates the means to maintain surface quality within prescribed limits. For the latter purpose, the "all-in" figure of the meter-reading is sufficient if the finishing machine produces no hidden waviness in the piece part (see later discussion). As a result, it is possible (Table I) to allocate machining operations according to useful and proved surface finishes. This table may be improved, but I think the fundamental idea is correct.

In writing specifications we must know:

1. The machining operations available.
2. The degree of finish obtainable on the existing machines.
3. The allowable limits of surface finish for a known purpose.
4. The possibilities obtainable by introducing new processes or by improving or supplementing the existing equipment.

Instead of guesswork or application of practical experience through sight and touch, we may now apply measurable numerical data, comparable to the tolerances of dimensional fits. If this were not true, the introduction of surface-finish standards into the workshop is hopeless.

The efficiency and practical value of surface-finish analysis will be demonstrated by examples including spur gear teeth, and the cylinder and piston of an air compressor.

Spur Gear Teeth

Gear teeth must possess the following requirements: (1) Sufficient strength, (2) wear resistance, (3) accuracy of profile, pitch, parallelism to axis, and concentricity to center, and (4) operation at satisfactory noise level.

In conjugate gears, each tooth of the pinion must mesh correctly with each tooth of the wheel; all of these teeth must be practically interchangeable. Otherwise sound is emitted, which is increased by deflection, wear and inaccuracies.

In a machine shop, noiseless gear action is an important matter, because even a little noise from one machine is amplified by the great number of gears in machine tools running at different speeds and with varying loads. If it is assumed that errors of accuracy are avoided or are within allowable limits of 0.0001 to 0.0003 in., the noise factor will depend on the quality of the tooth surface. Therefore it will be instructive to learn how smooth the different surfaces of gear teeth are, when manufactured by a first-class British firm[1], according to the most used methods.

The American Standard ASA-B 46.1-1947 prefers to replace the notation "Surface Finish" by the three characteristic features: (1) roughness, (2) waviness, and (3) lay.

My own opinion is that waviness, Fig. 1 should be the starting point, because surface waves are caused by three sources:

(a) Unsuitable shape and lack of rigidity of the workpiece.
(b) Faulty tools.
(c) Machines in poor condition or of poor design.

[1] All checked samples were made by *David Brown & Sons Ltd., Huddersfield, England*, whose collaboration is gratefully acknowledged.

Corrective steps are: If the design of the workpiece cannot be changed to improve rigidity, the speed, feed and area of chip must be reduced and possibly steady-rests applied.

Faulty tooling (the main source of trouble) results from improper cutting angles, weak tool shanks and excessive overhang. All three faults can be overcome by the setup man or the operator.

Well designed and built machine tools produce no waviness. Acceptance tests reject any machine tool that shows vibration marks (waves) when producing a test piece of prescribed accuracy by a finishing test at the highest possible speed. The often-heard statement that "waviness" is a consequence of machine faults" is untrue of good machine tools of current design and workmanship.

The importance of waviness is this: two parts may have approximately the same roughness (Fig. 1) but one has an even surface whereas the other has a wavy surface and is useless for the intended purpose.

The lay, or the direction of the predominant surface pattern, depends on the function of parts.

The lay of cylindrical bearings is generally measured parallel to the axis and across the feed marks. It is, however, controversial, if this "lay" is quite correct[*].

The lay of a gear tooth must be in two directions in any case: (1) around the involute (2) along the flank.

Smoothness of the involute curve guarantees noiseless action of the gear; smoothness of the flank avoids localized pressure contact of the teeth, and increases the load-carrying area and hence the wear resistance.

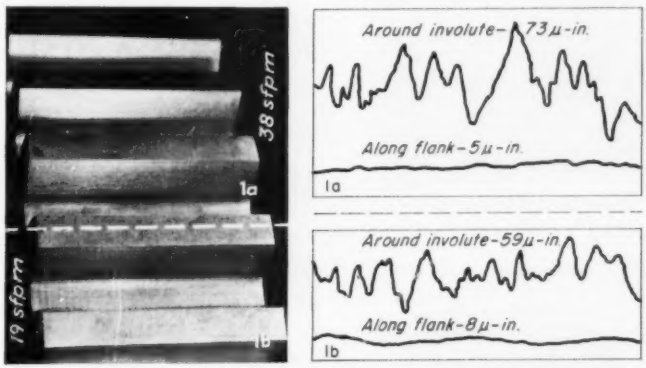
Figs. 2, 3 and 4 show the extraordinary differences in roughness around the involute as compared to along flank, in teeth produced by various gear cutting processes.

Let us discuss the details.

Fig. 2 compares the results of using a formed rotary milling cutter (methods 1a, b) with those produced by formed grinding (methods 2a, b). The milling cutter produced fairly rough involutes, between 59 and 73 mu.-in. (ave) roughness versus 5 to 8 mu.-in. along the flank. Contact pressure in service would be well distributed along the flank, but the gears might run noisily. A reduction of cutting speed from 38 sfpm. to 19 sfpm. did not help much, but increased the waviness along the tooth because of the reduced influence of the flywheel.

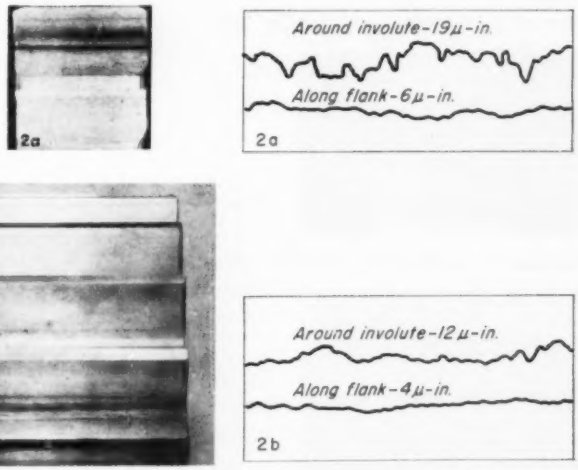
Methods 2a, b, in Fig. 2 illustrate the superiority of the form grinding process, and these explain why some leading British machine-tool makers apply form grinding exclusively to narrow and wide gears. Dressing of the grinding wheel by three cam-controlled diamonds allowed adaptation of the unloaded shape of the involute to the real form of the tooth under load. This modification produced noiselessly running teeth.

Fig. 3 illustrates the surface fin-



Methods 1a and 1b . . SOFT GEAR MILLED AT TWO SPEEDS

Ratio of vertical to horizontal magnification = 2000/50

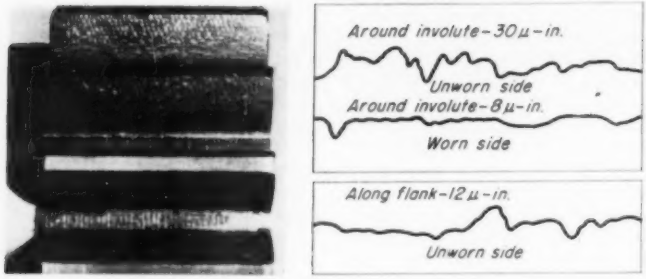


Methods 2a and 2b . . FORM-GROUND CASEHARDENED GEARS

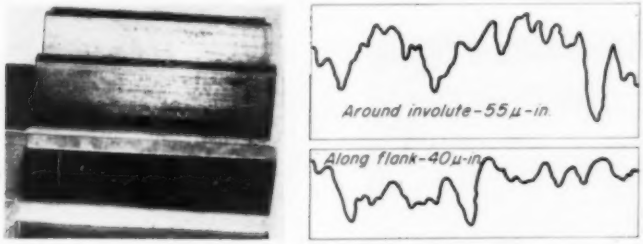
Ratio of vertical to horizontal magnification = 4000/200

Fig. 2 . . Of these examples of gear teeth produced with form tools, only that shown in method 2b has a profile roughness within the specified tolerances in Table I. British machine builders prefer to grind gears

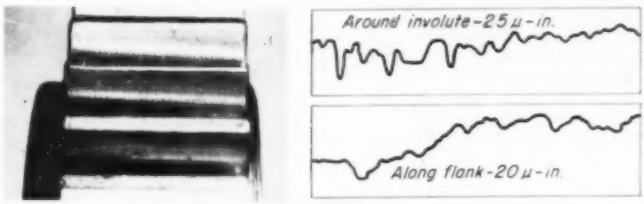
[*] Gisholt Machine Company, Madison, Wis.: "Wear and Surface Finish."



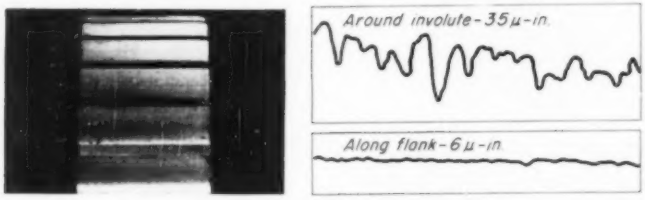
Method 1..HOBBED SOFT GEAR



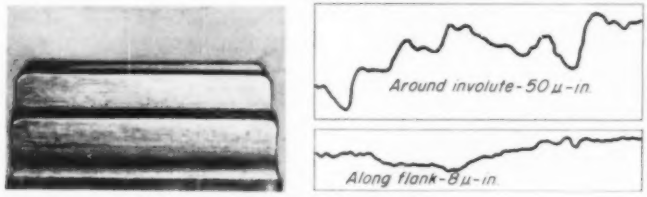
Method 2..HOBBED AND HARDENED GEAR, NOT GROUND



Method 3..HOBBED AND SHAVED GEAR



Method 4..SHAPED BY FELLOWS PROCESS



Method 5..PLANED ON SUNDERLAND MACHINE

Ratio of vertical to horizontal magnification = 4000/200

Fig. 3.. Pen records of roughness around the involute and along the flank show the comparative smoothness and waviness of gears generated by hobbing, shaving and planing

ishes produced on gear teeth by various generating processes. The examples are:

Method 1—Hobbed soft gear

Method 2—Hobbed, then case hardenend gear

Method 3—Hobbed and shaved gear

Method 4—Shaped gear

Method 5—Planed gear

These examples show what may be expected in roughness and waviness of the involute profile and the flank. Details are:

Roughness of the involute profile of hobbed soft gears is quickly improved by the running-in process, as shown by Method 1. By running in on a Werner burnishing machine for 2 hr., the bearing area was increased to 85%.

Hardened Gears Need Finishing

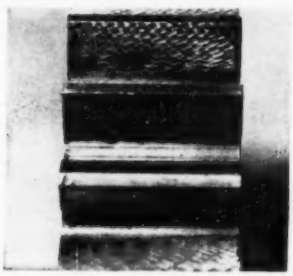
Case hardening of the hobbed gear increases distortion of the involute profile and the flank, as seen by Method 2. Roughness along the involute is increased from 30 mu.-in. to 55 mu.-in. and along the flank from 12 mu.-in. to 40 mu.-in. This test was made to show the necessity for a further finishing process on hardened gears.

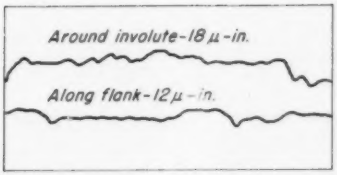
While shaving a hobbed gear (Method 3) produces a finer finish around the profile (25 mu-in.) as compared with surfaces generated by shaping and planing (Methods 4 and 5), the finish along the flank is inferior. Shaving marks were clearly visible.

Considerable improvement of both the involute profile and the flank was obtained in all cases where hardened gears were ground by a generating process, Fig. 4.

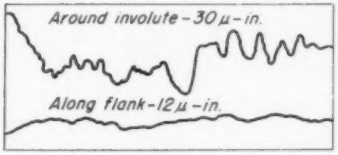
Method 1 shows the results achieved by grinding the tooth profile by the Maag procedure, which employs the flat sides of two wheels. The tiny flats all over the profiles are typical of this process but good results are achieved. The surface-finish measurements were: around the involute 18 mu.-in.; along the flank 12 mu.-in.

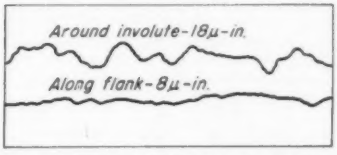
Two gears for a motor-car transmission are shown in method 2, Fig. 4. The larger gear, ground by the Maag process, is rougher on the involute and along the flank than the smaller gear, which was ground on Lees-Bradner equip-



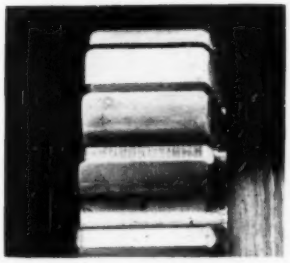


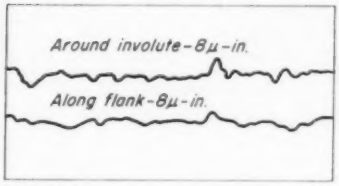
Method 1..HARDENED GEAR GROUND BY MAAG PROCESS





Method 2..COMPARISON OF GEARS GROUND BY MAAG AND LEES-BRADNER PROCESSES





Method 3..HARDENED AND LAPPED GEAR

Ratio of vertical to horizontal magnification = 4000/200

Fig. 4..Generation of gear teeth by grinding processes improves the profile and is used by British makers of automobiles and machine tools

Fig. 5..Both oscillating and reciprocating motions are used in the Werner two-spindle gear lapping machine

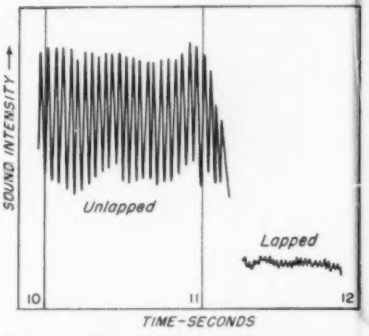


Fig. 6..An extraordinary decrease in gear noise is achieved by lapping, especially when the gear is accurately cut. This diagram was derived with a phonograph-type pickup

ment. In this case, surface finish of the Maag-ground profile is not as good as in the previous example, but roughness along the flank is the same. However, the gear ground by the Lees-Bradner method is superior in both respects and will presumably provide greater contact area and run with less noise.

Lapping of hardened gears improves the involute profile, as shown by method 3, Fig. 4. Here it is seen that employment of a Werner machine, Fig. 5, which combines rotating and oscillating motions, reduced the surface roughness around the profile to 8 mu.-in. Subsequently, the lapped gears were tested on a sound-emitting machine. The phono-diagram, Fig. 6, shows that lapping the gear produces an extraordinary decrease in the noise. This is true when the pre-lapped gear is held to 0.0001 to 0.0002 in. of true form, maximum drunkenness in one turn is about 0.0002 in., and the maximum accumulated error is not greater than 0.0003 in.

The importance of lapping to improve finish and form is further illustrated by Fig. 7.

All pen records and average readings of surface roughness were taken with a "Talysurf" surface analyzer, especially equipped to analyze the surfaces of gear teeth. It is obvious that this combination of pen records for details and of meter readings for routine inspection (Table I) should

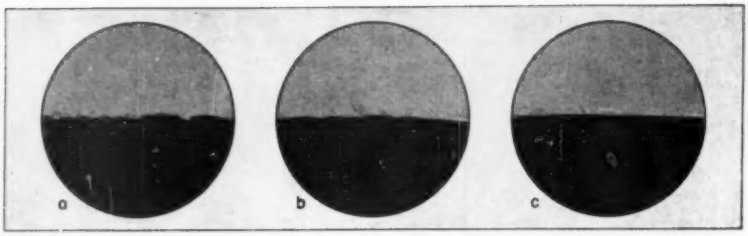


Fig. 7.. Magnified profiles of gear flank indicate the relative value of grinding and lapping to improve surface smoothness: (*a*) shaped and hardened condition, (*b*) ground, (*c*) lapped

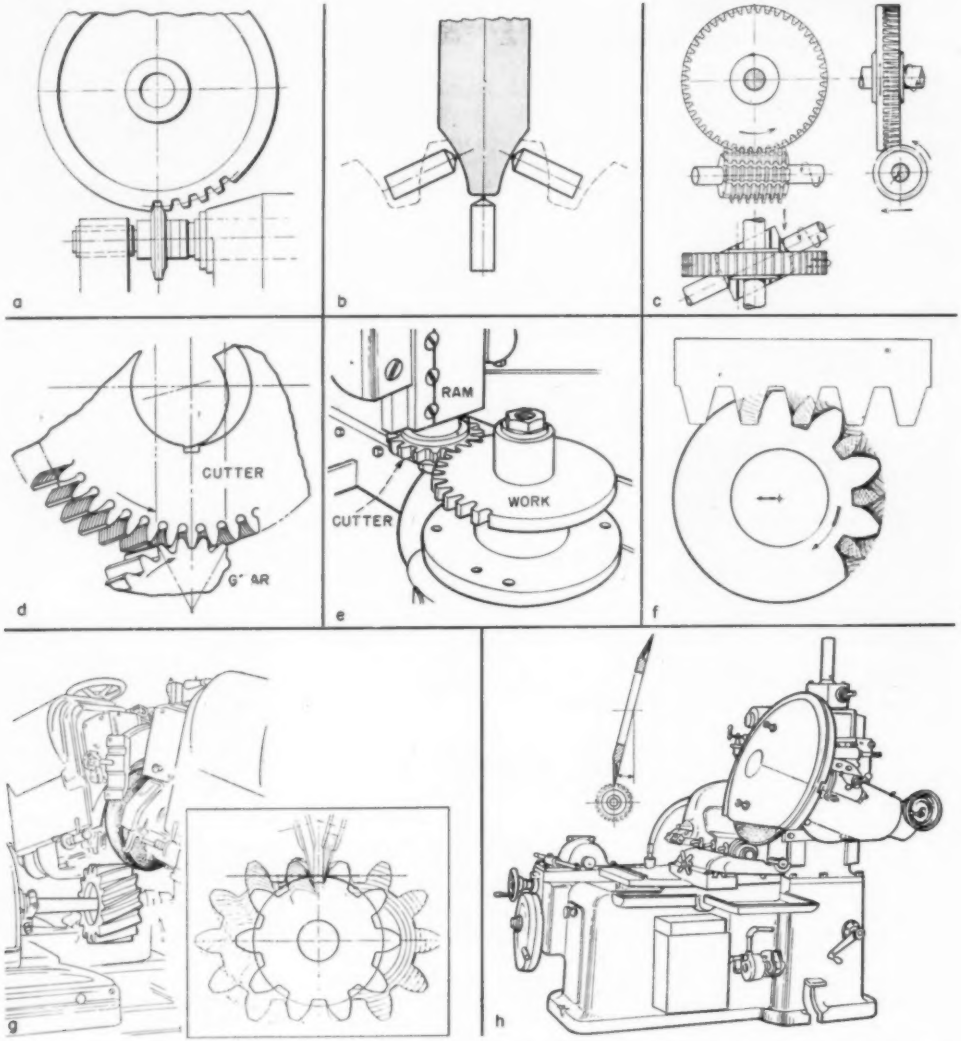


Fig. 8.. Principles of gear manufacturing processes: Forming—(*a*) milling with formed cutter, (*b*) grinding with formed wheel dressed with three cam-controlled diamonds—Orcutt method; Generation—(*c*) hobbing, (*d*) shaving, (*e*) shaping, (*f*) planing with rack cutter—Sunderland-Maag method; (*g*) grinding flanks of two teeth with sides of two wheels and moving gear—Maag method; (*h*) grinding tooth flank with large wheel, no axial movement of gear—Lees-Bradner method. Comparative roughnesses produced are shown in Figs. 2, 3 and 4

be a great help to production of suitable gears, particularly when waviness, caused by any source, is eliminated before regular manufacture is commenced.

A résumé of the principles of gear-cutting, grinding and lapping processes used in this investigation is provided in pictorial fashion in Fig. 8.

Cylinder and Piston

The taking of pen records of internal surfaces is much easier than investigation of the surface roughness of gear teeth. Fig. 9 shows the progressive improvement obtained by grinding, honing, and running-in of an air-compressor unit.

The machine is a single-cylinder, two-stage, air-cooled, reciprocating compressor. It comprises a finned cylinder having a bore of two different diameters in which a piston is reciprocated by a crank and connecting rod. The piston is also formed with different diameters to fit the cylinder.

Under normal conditions, and when driven at a speed of 1,200 rpm., the compressor is capable of charging an air bottle of 400 cu. in. capacity to a pressure of 600 psi. in approximately 8 min. or to 1,000 psi. in approximately 18 min.

The light aluminum piston has two portions of different diameters; the larger diameter forming the head. When the piston is in position in the cylinder, an annular space is formed between the skirt and the cylinder wall.

On the downward stroke of the piston, air is drawn through the inlet valve into the cylinder above the piston. On the upward stroke, the air is compressed and passes through a transfer valve to the annular chamber formed between the piston and the cylinder. Then, during the next downward stroke, the air is further compressed and forced through an outlet valve to the air bottle.

To obtain high efficiency and avoid leakage, the clearances between the piston and the cylinder head, and the cylinder at top and bottom dead centers, are made as small as possible. Therefore, the working surfaces must have a very fine finish; waviness must be avoided.

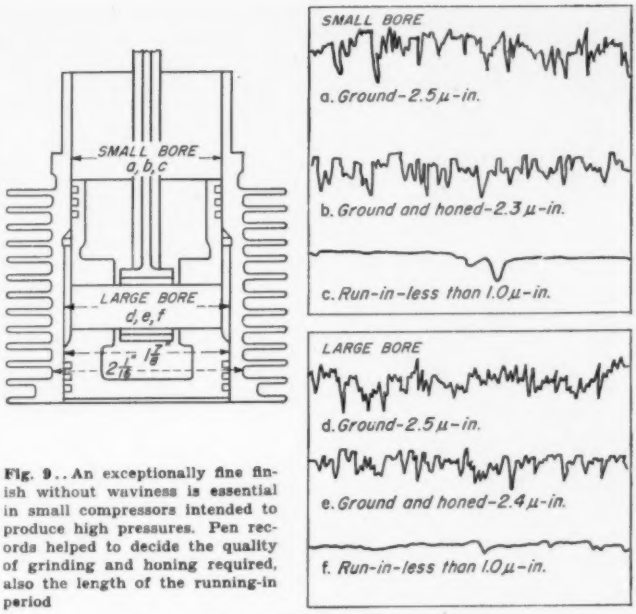


Fig. 9.. An exceptionally fine finish without waviness is essential in small compressors intended to produce high pressures. Pen records helped to decide the quality of grinding and honing required, also the length of the running-in period

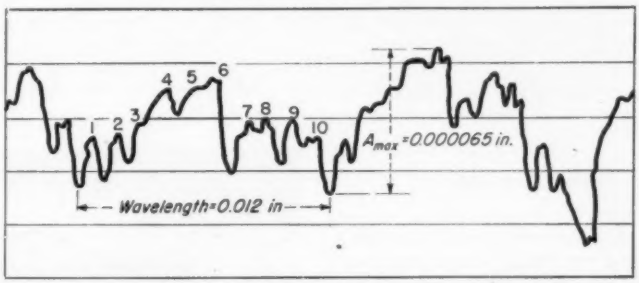


Fig. 10.. Incorrect diamond-tool shape and inadequate support of the tool bar produced waves in the precision-bored surface of a bronze bushing. Modifications in setup eliminated waviness, reduced roughness of the surface

The cylinder was made of heat-treated 4.0% nickel-chrome steel, quenched and tempered; the aluminum piston is fitted with cast-iron rings and is ground to within about 0.0003 in. of finished size and finally honed.

Pen records of surface roughness and average readings of the internal surfaces are given in Fig. 9. Results found were: The *ground* surfaces *a* and *d* of the small and large bores were slightly wavy with the usual sharp crests of the grinding action. Surface roughness was 2.5 mu.-in.

Honing the cylinder did not improve the roughness to any extent, but did flatten the crests, as at *b* and *e*, ready for the running-in process.

When running in was carried out for periods of 30 to 60 min., at 1,200 rpm., the honed surfaces were refined from 2.3 mu.-in. to 1 mu.-in., and this surface gave very satisfactory service life. The pen records *c* and *f* show some deep scratches, as a carry-over from the grinding operation, but these did no harm.

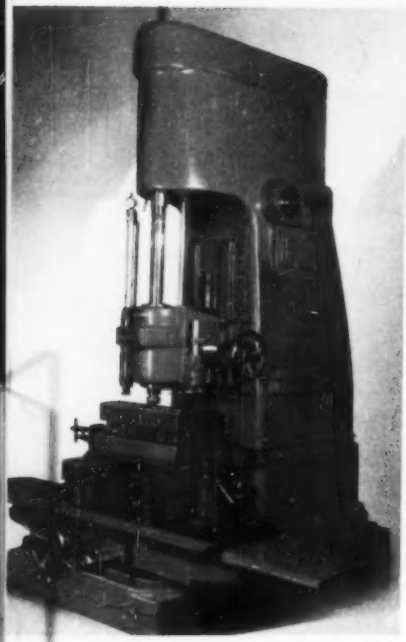


Fig. 11.. Precision diamond boring of the bronze bushings was done in this Krause machine. Like most modern machine tools, it did not vibrate or otherwise cause the waviness and roughness encountered in the original setup

To Eliminate Waviness

To improve a diamond-boring operation, a pen record was made, Fig. 10. Details of the setup were: Krause heavy-duty precision boring machine, Fig. 11; bronze bushing pressed into iron casting; diameter of bore, $2\frac{3}{4}$ in.; spindle speed, 380 rpm.; feed, 0.0012 in. per rev.; tool, standard 90° diamond.

The pen recording showed fairly regular waves of a mean length $L = 0.012$ in. and ten roughness peaks (rather evenly spaced) per wave-length. Thus these peaks corresponded well with the feed per revolution.

Maximum average amplitude of the wave $A = 0.000065$ in. or about six times the h_{av} of 11.5 mu.-in., which corresponds to usual performance.

Since the machine itself evinced no vibration, the shape of the diamond was improved and better support provided for the boring bar. After these modifications, the waves disappeared and the surface roughness was reduced to 7 mu.-in.

Rigid Tools for Heavy Work

Tough, work-hardened material, such as found in electric-railway wheels that have seen hard service can be properly finished, if the returning operation is carried out on a first-class machine with rigid tooling. A tread surface of 125-250 mu.-in. has been secured under these conditions:

It is difficult enough to turn new tires of the composition used, but the load on the cutting tools is greatly increased when work-hardened material is involved. In service the tires are subject to frequent braking and a high percentage of them are direct driven. And the wheels are of small diameter, averaging 36 in., and with a total width of 4 15/16 in. and a tread width of $3\frac{3}{8}$ in. Even so, the tread-forming tools turn between 15 and 20 treads between grinds, and the returned wheels have a life of 30,000 to 100,000 miles.

Wheel material: chrome-moly steel of 42-48 tons tensile strength.

Material removed: up to $\frac{5}{8}$ in.

Cutting speed; 15 to 20 sfpm.

Depth of cut: 1/32 to 1/16 in.

Tool material: 18% tungsten, 5% cobalt, high-speed steel.

The operation is carried out on a wheel-turning lathe with a rigid turret, Fig. 12. The vertically positioned, form turning tools have an initial height of 10 in. Operational sequence is: roughing the flange and tread with two solid tools; forming the flange with a solid tangential form tool and forming the tread with a solid tangential form tool. Average time to turn a work-hardened tire is 60 to 70 min.

These examples of the practical application of surface-finish measurement indicate that pen recordings can be helpful in improving the setup and the quality of the work. As time goes on, further education of the entire engineering and production staff in application of the method will reduce assembly and fitting time and perhaps enable realization of non-selective assembly.

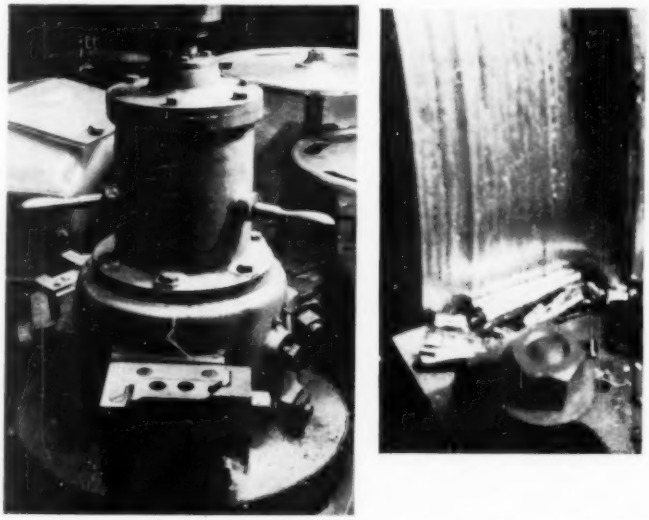


Fig. 12.. Solid tangential form tools (4 15/16 in. wide by 10 in. long) and a rigid turret enable turning of work-hardened, worn car wheels to a surface finish of 125-250 mu.-in. Finished surface of the carwheel tread (right) is not visible, but the view shows the shaving action of the wide tool for the tread

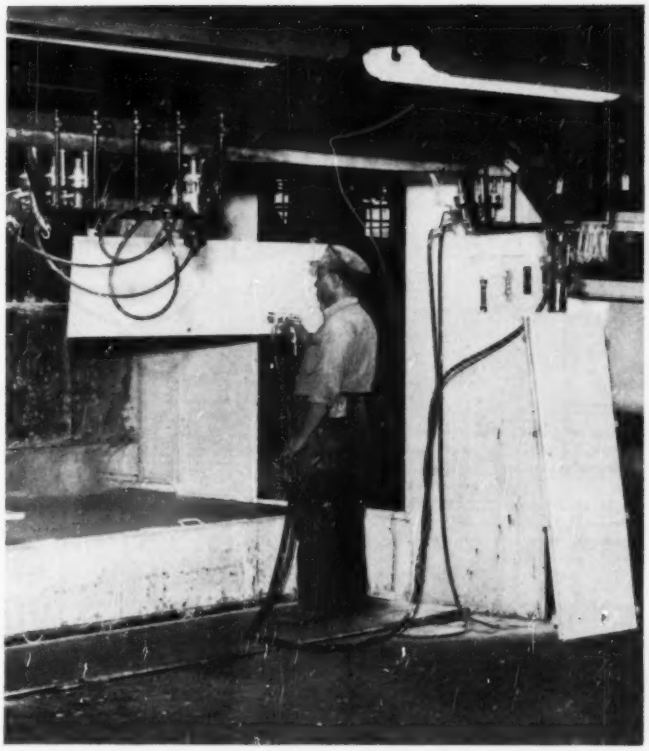
PAINT ON TAP

BY WALTER SCHMID
Chief Industrial Engineer
STEWART-WARNER CORP.

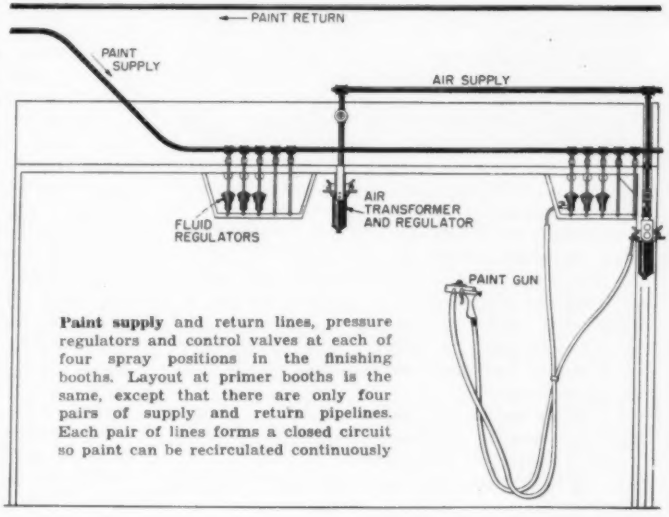
Conveyorized finishing setup for Alemite lubrication units features multi-gun spray-paint stations for handling various colors

ALEMITE LUBRICATION units for the automotive service industry are produced in a new, integrated department at the Chicago plant of Stewart-Warner Corp. This department produces the structural frames and covers for a new line of lubrication equipment, and installs, in the assembly area, the component parts, such as pumps, control valves and swivels, manufactured in other departments. It has the necessary power shears, press brakes, punch presses, resistance welders, arc and oxyacetylene welding equipment, sanders and polishing lathes to perform a wide range of sheet-metal operations.

The outstanding unit is a spray-paint finishing room served by a continuously moving overhead chain conveyor. Speed of this 1,048-ft. conveyor can be varied between 6 and 12 fpm. Present speed is 8 fpm. and conveyor makes a complete circuit in 131 min. Blowers deliver 75,000 cfm. of filtered, heated air to the pressurized room, from which four water-curtain spray booths exhaust 60,000 cfm. Excess intake of air provides an air curtain at room openings to and from the two overhead baking ovens, and at conveyor entry and

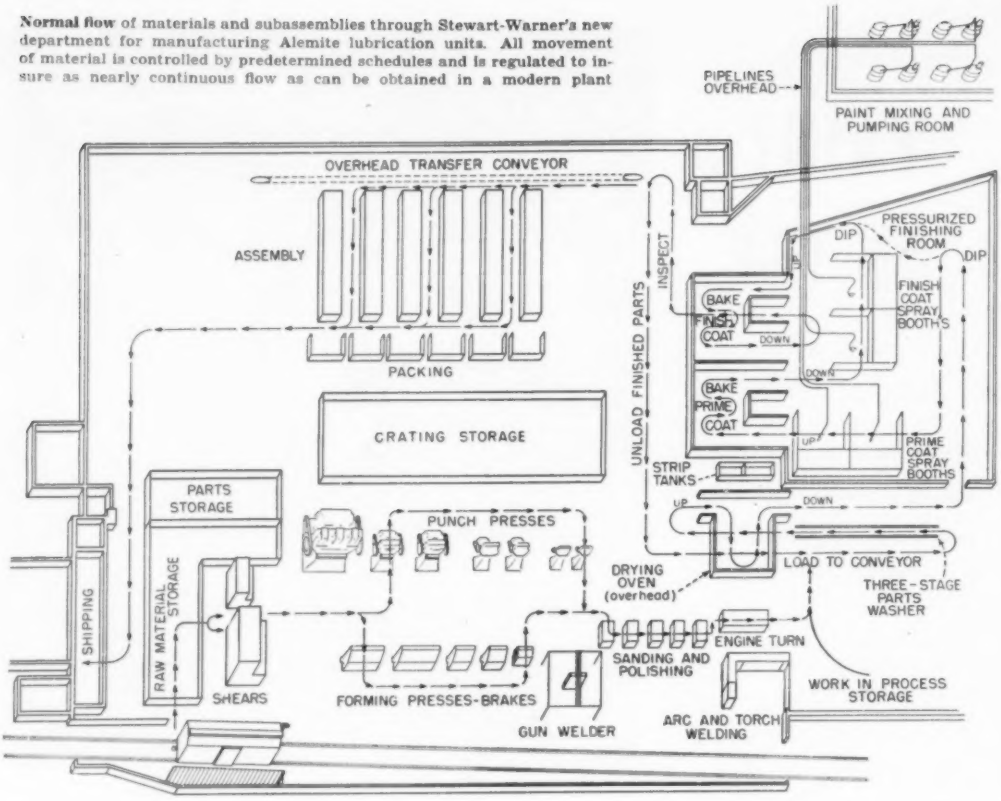


Paint spray station in front of water-curtain booth, showing two paint supply line outlet stations, with air and paint regulators and hose lines. Paint distribution system can deliver eight different paints to eight different spray guns simultaneously. Ordinarily, only three outlets are under pressure at each station



Paint supply and return lines, pressure regulators and control valves at each of four spray positions in the finishing booths. Layout at primer booths is the same, except that there are only four pairs of supply and return pipelines. Each pair of lines forms a closed circuit so paint can be recirculated continuously

Normal flow of materials and subassemblies through **Stewart-Warner's new** department for manufacturing Alemite lubrication units. **All movement** of material is controlled by **predetermined schedules and is regulated to in**sure as nearly continuous flow as can be obtained in a modern plant



exit openings to insure against entry of dust-laden air and protect the quality of the finish.

All production lines in the department feed parts to a work-in-process storage area, from which the parts are loaded onto the conveyor for finishing. Finishing process includes the following stages:

1.. Clean in three-stage washing machine. The cleaning cycle includes a 60-sec. spray with an acid-phosphate cleaner solution at 160-180 F.; a hot (160-180 F.) water spray rinse for 45 sec., and a 45-sec. spray with a 140-160 F. rinse containing an acid neutralizer to leave a rust preventive on the workpieces.

2.. Dry in overhead oven for 4 min. at 340 F.

3.. Enter pressurized finishing room. Parts to be dip coated are removed from conveyor, dip coated and returned to conveyor, as indicated on layout sketch, at a point just ahead of the entry into the finish baking oven. They thus bypass the primer-spray booths, the primer baking oven, and the finish-spray booths.

4.. Spray paint with primer coat—two 15-ft.-long water-curtain booths set end-to-end, and each equipped with two spray stations.

5.. Bake primer coat for 10 min. at 315 F. in overhead oven.

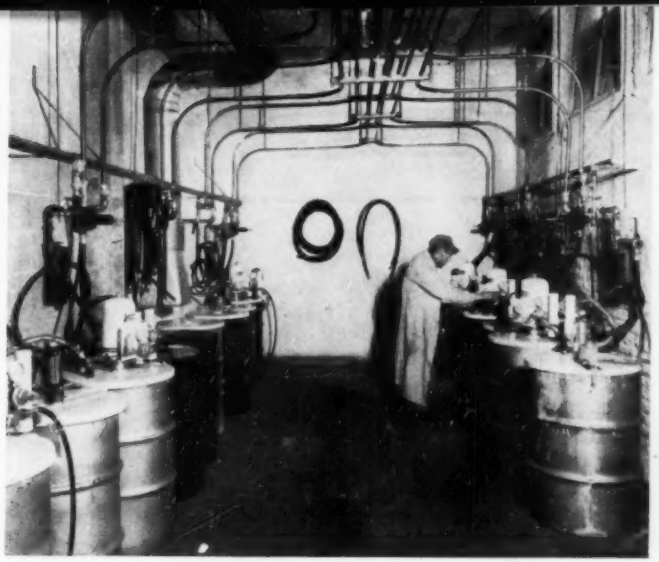
6.. Spray paint with finish coat of enamel—two 15-ft.-long water-curtain booths set end-to-end, and each equipped with two spray stations.

7.. Bake finish coat for 10 min. at 310 F. in overhead oven.

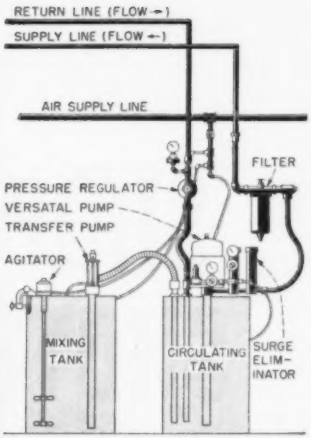
8.. Return to floor level and leave pressurized room for final inspection of finish, and removal of parts from conveyor. Items which do not require further assembling are unloaded near the area where they are packed and loaded on pallets for shipment. All other parts are transferred to overhead chain transfer conveyor for delivery to assembly area.

The three ovens are heated with gas-fired Burdett infra-red burners. Safety controls include purging cycle before burners can be ignited. Each oven has internal recirculating ductwork to insure uniform oven temperature. Oven panels have 6-in. insulation for drying oven, and 4-in. insulation for baking ovens. There is approximately 30 ft. of conveyor travel in the drying oven, and about 80 ft. in each of the baking ovens.

Paint distribution system is capable of supplying eight different paints, if necessary, to eight spray gun operators. Four recirculating paint supply lines have outlets at each of four primer-coat spray sta-



Paint distribution units in mixing and pumping room. Ventilation provides ten air changes per min. No elbows, tees or couplings are used in overhead paint piping system, to avoid cavities in which paint can lodge and so make changing of color or type of paint in a circuit difficult. Long-radius bends and aircraft-type press are couplings are used instead



Arrangement of unit making up each paint mixing and pumping (distribution) center. When color or type of paint handled by a unit is to be changed, or circuit needs cleaning, Versatal pump feeds solvent through pipe line. Solvent is stored for use with paint of the same type and color

tions; and five outlets are available at each of four finish-coat spray stations. Eight paint supply lines and eight return lines, made of 1-in.-dia. seamless steel pipe, connect the spray booths with the paint mixing and pumping room set up in a separate building to localize fire hazards. Normally, three pipe circuits are used for primer-coat materials, three for finish-coat enamels, one serves as a spare for either primer or finish, while the eighth is a spare for finish only.

About 3500 ft. of 1-in. pipe is used in the paint supply network. Between buildings, the 16 pipelines run through a 4 x 4-ft. duct supported 7 ft. above the ground. Walls of the duct are heavily insulated so outdoor temperatures will not affect the rate of paint movement. Duct is large enough to permit any needed maintenance operations.

Each spray booth uses approximately 55 gal. of paint each 8-hr. shift. This is delivered at 40 psi. and is reduced to 20 psi. at the spray guns. There are three fluid-pressure regulators, three fluid valves, three fluid tubes, and three hand spray guns —one for each color. In addition there is an air transformer and regulator at each station and an air condenser for each set of four spray stations.

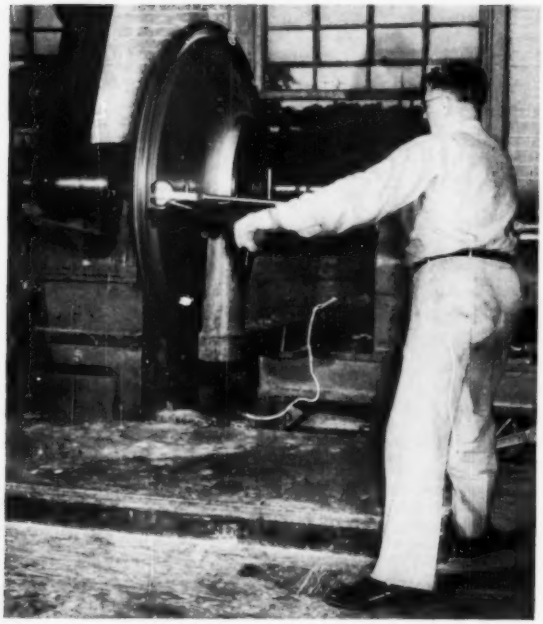
In the paint mixing and pumping room are eight individual paint distributing units, one for each supply circuit. Each consists of a mixing tank and a paint circulating tank—the tanks being standard 54-gal. steel drums standing on end. Paint is forced into the pipe circuit and back to the circulating tank with a standard Alemite Model 7808 air-driven Versatal pump capable of delivering approximately 3½ gpm. Thus each pump can accommodate four or five spray guns under normal operating conditions. To assure delivery of clean paint at even

Sensitive General Electric electronic gage is used to check paint thickness within 0.00025 in. This can be done while conveyor is moving workpiece past inspection station, as test is rapid and non-destructive. All finished parts also get visual check

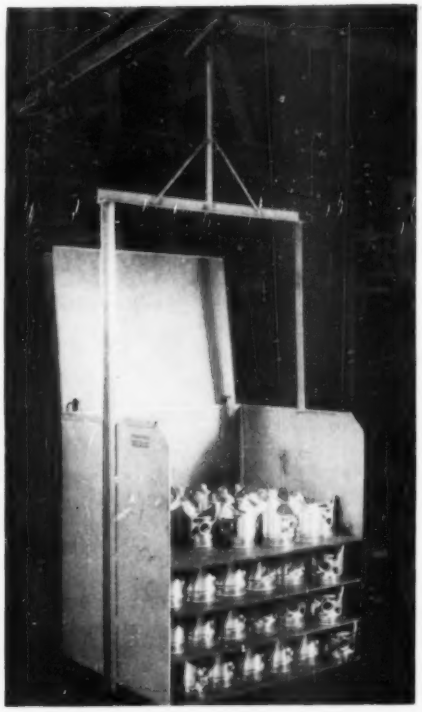
pressure, there is an Alemite Model 307980 surge eliminator and a Cuno filter in each supply line, and a DeVilbiss Model PHG-521 pressure regulator in each return line.

Paints and solvents are transferred from supply drums to the mixing tanks, and from the mixing tanks to the circulating tanks with a standard Alemite Model 5344 air-operated transfer pump. An Alemite Model 7810 air-driven agitator in each mixing tank insures proper mixing of the paint.

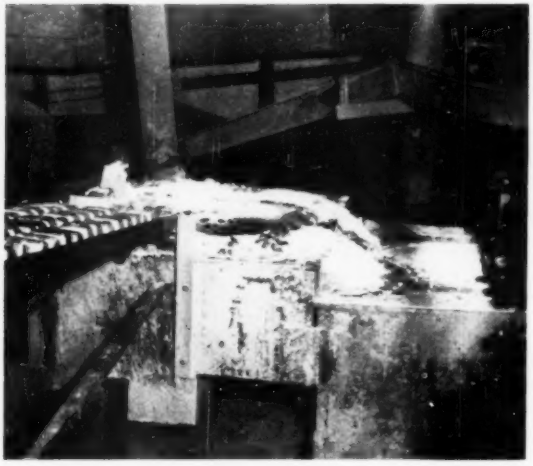
SHOP SHOTS



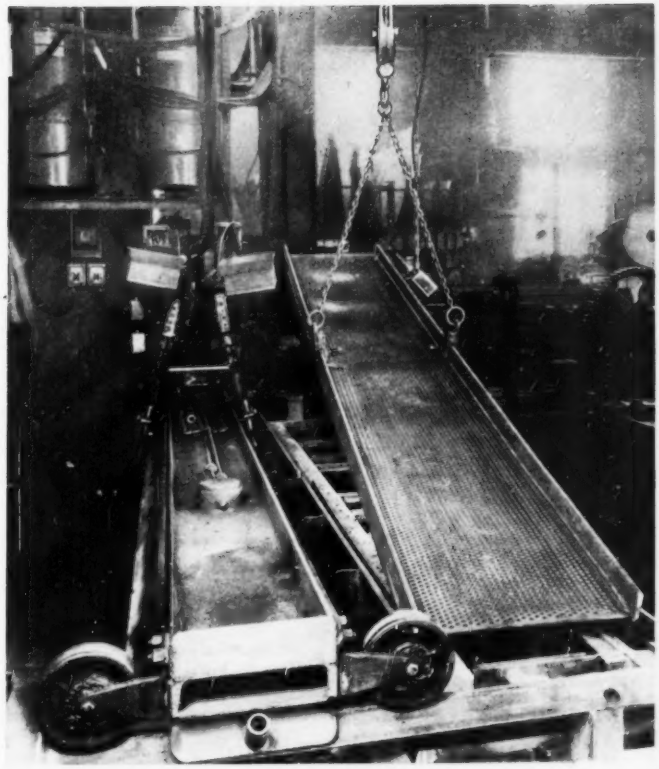
Aluminum air-diffuser cone is spun on belt-driven spindle by tool carried on bar aligned by operator. Leverage is applied through second bar (left hand) that pivots on a pin inserted in one of several holes in toolrest. Leverage bar in turn supports tool bar via a pin through both. Cones from 2 in. to 7 ft. dia. for custom-engineered air conditioners using an "aspirating" air diffuser are spun for economy. *Anemostat Corp. of America.*



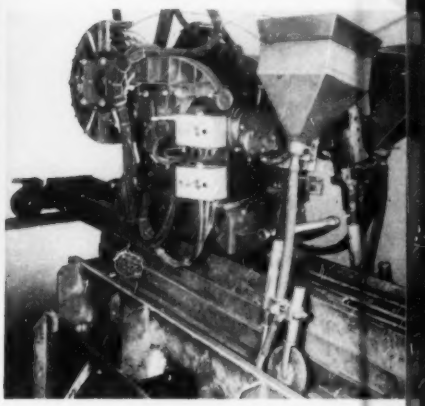
Six-deck carriers transfer high-compression pistons from automatic tin-plating machine to balancing machines and ring assemblers. Slotted ¼-in. Masonite separators pivot on two rods and flip down to form non-scratching surfaces. Operators push roller trollies along track to deliver their own work. *Oldsmobile Div., General Motors Corp.*

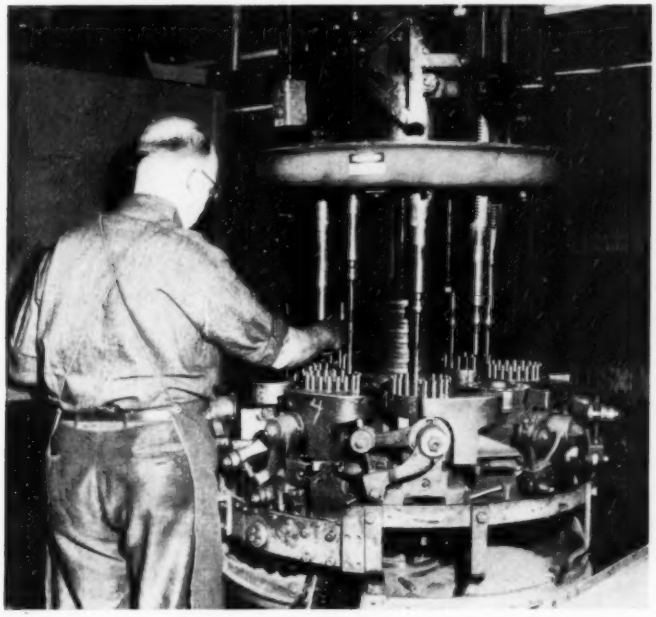


Double-pot die-casting system maintains constant feeder temperature and clears dross for Ford hardware-accessory production. Zinc ingots move from conveyor at left to preheating pot, melt and overflow to feeder pot at right. This eliminates temperature drop when new ingot is added to pot; also reduces casting imperfections and buffing requirements on 50,000 auto parts a day. *Cannon Electric Development Corp.*



Two submerged-arc welders mounted on a single carriage join perforated tray to side panels (left). Welded fixture clamps sides and tray bottom, and Unionmelt heads are rolled over the top and locked in position. One 18-in.-wide tray is turned out in six minutes with no subsequent cleaning or chipping necessary. Heads are shown in closeup below. *Linde Air Products Co.*

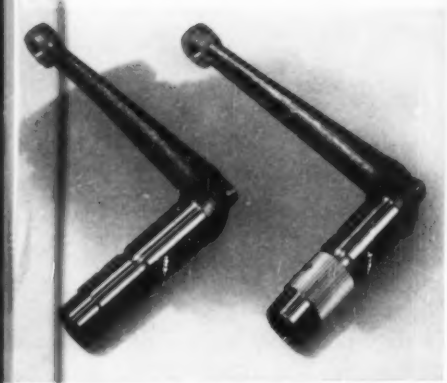




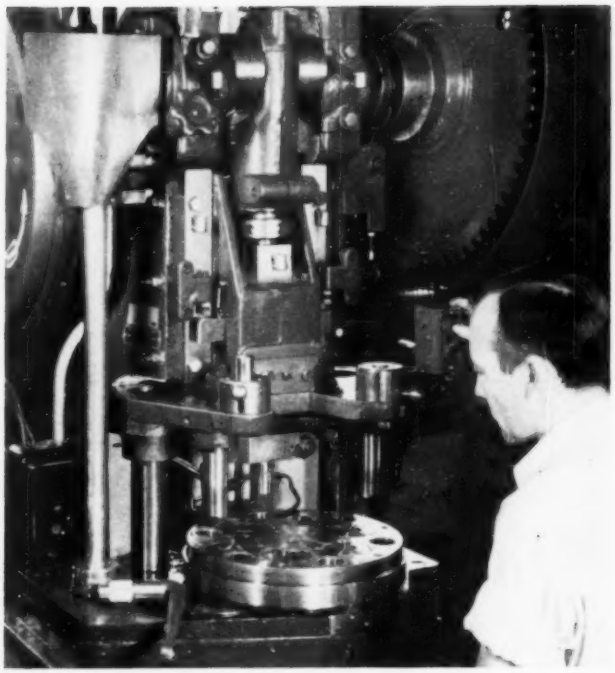
Cored holes in partly finished valve guides are roughed, trued and reamed to close tolerances in automatic chucking machine. Half a dozen heads carry up to 18 guides each, with the operator filling as many as possible at station 4. Finished guides drop out below into a chute. Non-stop operation, fed by two centerless grinders roughing and finishing the O.D., produces 42 a minute. *Oldsmobile Div., General Motors*

PUNCH PRESS BROACHES SPLINE

BY D. C. HANELINE,
President, FEDERAL INDUSTRIES, INC., DETROIT



Forged SAE 1030-1040 steering arms are completely machined before delivery to the press. Upper 1.310-in. turned diameter locates in clamp to center lower portion for serrating

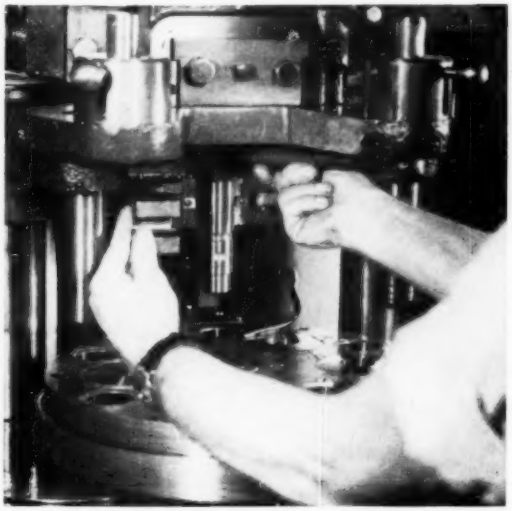


Indexing broach holder mounted on standard Perkins press is driven by helical gear on crankshaft end which operates vertical shaft (at left) to mechanism. Large guide pins at rear are in fixture base and guide press ram. Two smaller pins in workpiece holder nest alternately in six hardened-steel bushings between the six ring broaches as holder indexes

THE punch press that broaches steering arms for Ferguson tractors at Federal Industries works full time because the broaching fixture, designed, built, and installed by Detroit Broach Company, can be easily removed to allow normal press work. Instead of hobbing the serrations at an estimated 22 parts per hour as originally planned, Federal produces 65 arms an hour, and does both right- and left-hand units in the same setup.

The close-tolerance serrations are produced in six ring broaches set in a fixture on the bed of the press. Accurate location rotationally, provided by the pins slipped into a hole in the end of each arm, is necessary because of one skipped tooth, located 37° from the plane of the part.

Sharpening is done by removing the broaches and grinding their tops flat, which removes little material and produces new, sharp edges. Parts are spot-checked to learn when sharpening becomes necessary.



Hinge-type clamp with tie bolt holds on turned diameter while either right- or left-hand pin with handle (above operator's hands) is slipped down to locate the part rotationally in 0.725-in. hole in end of arm

"Give us the tools . . ."

What Are *YOUR* Chances If There Are No Profits?

Since the November 2 election there has been a dazzling variety of plans to have the government do more and more things and spend more and more money. But there is almost no variety in the plans which are suggested to raise the money.

"Pay for it by taxing profits," is the standard refrain. Slap on an "excess" profits tax. Boost the corporations' income tax rate.

Well – why not? Haven't the corporations been making so much money that a big chunk of it can be turned over to the government spenders without hurting anybody?

The answer is no!

How high profits should be can be debated endlessly. Some people claim that 1948 corporation profits, which will amount to about $20 billion, are too high. They emphasize the fact that profits are larger in relation to investment than they were a few years ago. Other people think profits are low. They stress the fact that profits are not much larger in relation to sales than they have been historically. Both sides agree that in some individual cases profits have been too high, as in others they have been too low or non-existent.

But if we cut the total volume of profits drastically, we shall do so at our national peril.

There is no room for debate about that. For we shall choke off the crucially important job of building new plants and equipment for our industries. Squeeze hard enough, and America will go the way of Britain – down the long and painful skids of industrial decline. Widespread unemployment, especially among our industrial workers who produce new plants and equipment, will mark the dreary way. Here is a fact which the President, the Congress, the C.I.O., and all of us have a real reason to remember:

Almost two-thirds of all profits today are going to rebuild and improve plants and equipment.

More than $13 billion of this year's profits are being plowed back. They are going – as a large proportion of profits have always gone – to buy for workers better tools to work with, better surroundings in which to work. They are making possible better products, and more of them, for all of us.

The figures below show how companies have put more and more profit-dollars and a larger share of their profits to work in the business:

YEAR	PROFITS REINVESTED	% OF TOTAL PROFITS
1929	$2.6 billion	31%
1939	1.2 "	24%
1943	5.9 "	57%
1944	5.2 "	53%
1945	4.2 "	47%
1946	6.9 "	55%
1947	11.2 "	62%
1948 est.	13.0 "	65%

continued on next page

The record shows that each of us is the real beneficiary of this plowing back of profits.

Every American has benefited from these profits. Each dollar that business has put into its plants and equipment in the last thirty years has increased our yearly production by 35 cents.

This re-investment of profits has helped make possible a 75% increase in living standards since 1919.

It has helped increase wages from an average 48 cents an hour in 1919 to $1.36 today. Allowing for higher prices, that increase means that an hour's work today will buy twice as much as it did thirty years ago.

Why must business retain these billions of profits to improve its plants and equipment? Why must it plow back more and more? *The reason is that business already is caught in a tax squeeze.*

Federal taxes alone take at least thirty-eight of each one hundred dollars a company earns. Then, if the company pays out to its stockholders any part of what is left as dividends, the federal personal income taxes of the stockholders may take up to 77% of those dividends. Under these conditions, so few people are willing to invest in industry that the stock market is stagnant. Companies can not raise in that market the money they need for improvements.

The result: business must rely more and more on plowed-back profits to pay for new plants and equipment.

We know that everywhere in industry new and better ways of producing goods are standing ready for use. The previous editorial in this series mentioned some of them. We know, too, that depression and war put our industries far behind schedule – as much as $100 billion behind – in getting the new tools they should have had to keep themselves in first-class shape. McGraw-Hill is now completing a survey of industry that will measure these needs. The results will be published in this editorial series. We know already that in 1949 alone industry will need $18 billion or more for this purpose.

And all but a small fraction of that sum must come from profits.

Our prosperity, our strength as a nation, our hopes for better living depend on our continuing to generate and to plow back a large volume of profits.

For that reason we should not thoughtlessly follow these people who propose to pay for any and all new government activities by saying simply, "Soak the corporations." There is no need to follow them. There are other ways of obtaining necessary funds.

First and foremost should be economy within the government itself. If its citizens must pay still higher taxes, then surely government should exercise rigid self-restraint, cutting out all but the most essential activities and expenses.

After economy should come consideration of a broader federal tax base.

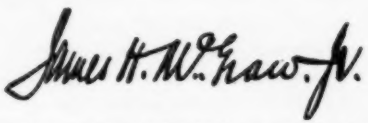
If these and other methods of raising money are inadequate and if taxes must take a bigger bite from business profits, two facts are clear. We should not adopt an "excess" profits tax with all of its complications and all of its corrupting effect on business. A moderate increase in the regular income tax on corporations is much less dangerous. *But even such an increase, if necessary, should be accompanied by special allowances for expansion and depreciation that will encourage companies to continue spending their earnings for new plant and equipment.* We all have a stake in that.

At this critical juncture in our history profits have a new and vastly more important role than they have ever had. In unprecedented degree they are the drive behind our present prosperity and the key to a better, stronger future.

Give profits the axe and the blow does not stop there.

It cuts into the employment, the prosperity and the strength of our nation.

Everyone of us has a stake in how the President and Congress handle taxes on profits – and now is the time to remind them of that stake.



President, McGraw-Hill Publishing Company, Inc.

ROUND TABLE

Working the Willing Horse

"Hello, Ed," greeted Al, "What's Williams in such a rush about this morning?"

"Oh, he's getting a job out for me—I told him it was badly needed and asked him if he'd put on the pressure to get it out."

"Didn't Williams just get through with that rush order for Billings?"

"You're right there, Al," smiled Ed. "What seems to be worrying you about Williams?"

"Oh, I'm not exactly worried, Ed; I'm thinking in terms of a man's wearing qualities, that's all—what puzzles me is why you pick on the same man all the time."

"Simply because he's willing to help me out," Ed replied. "A foreman generally knows who's the right man to give a job to in an emergency."

"That's all very well, Ed, to know you have a man who isn't afraid of a little extra effort, but, don't you think you can work a good horse to death?"

"Work a good horse to death!" Ed exploded. "Man, it's up to me to get the work out, and I might as well take advantage of an opportunity placed right before me."

"The opportunity in this case being Williams' willingness to pile in and get the work out, eh?"

"You got the idea, Al—if Williams doesn't object I don't see where the harm comes in."

"Maybe you don't realize it, Ed, but you can take too much advantage of a willing man—remember Perkins, the fellow you had around here several years ago, who would bore in and put his shoulder to the wheel in a pinch?"

"What's Perkins got to do with this case?" puzzled Ed. "There was nothing but willingness on his part to do me a favor."

"He up and quit eventually, didn't he?" Al spoke up. "Way down deep in your heart don't you think that there was a smoldering fire of resentment in the man that caused him to leave here and go elsewhere?"

"What if he did; there's always another one to step in his shoes when the time comes."

"Personally, I don't like the idea of taking advantage of a willing worker—I'd rather spread such rush jobs around—there can't help but be a feeling among the other fellows that you're unduly picking on a guy."

"For the life of me, Al, I can't see where you get your idea from—it's entirely between me and the individual—if he's fool enough to do the work and not complain, why should I worry."

"Maybe the fellow won't complain, but there is likely to be a burning resentment that'll do no good in the long run."

"You and your fair-practice philosophy! 'Damn the torpedoes—full speed ahead' is my motto, Al."

***SHOULD THE MAN** capable of extra effort be given the rush assignments? Can the added work of such a man, and his dependability be recognized? Your opinions or comments will be appreciated by others. Discussions of earlier topics appear on later pages.*

Steel Die-Castings Produced Successfully

By a combination of tungsten-carbide lined injection cylinders, an induction furnace, and silicone die lubricants, steel die-castings are now produced commercially

BY ROBERT B. STANTON, CONSULTING ENGINEER

WITH THE AID of precision-controlled electrical heating apparatus, steel products are now being inexpensively die-cast with presses analogous to those used in the injection molding of plastics.

The process is considered revolutionary from the engineering viewpoint, because it was heretofore assumed that production tooling for efficient molding of molten steel could not be fabricated with available materials. Successful results may be attributed to:

(1) Use of a coreless induction furnace, in which the molten temperatures of commercial steels can be regulated within minimum limits.

(2) Development of an injection press which can be fed by tilting the furnace, and which has an injection cylinder that can withstand enough preheating to maintain the molten fluidity of the steel.

(3) Fabrication of injection dies from drop-forged steel, in which silicone lubricants prevent premature die burning.

The furnace is an Ajax-Northrup design and might be termed an air-cored transformer—its primary element being a surface coil, to which the furnace charge is secondary. The coil consists of copper tubing, insulated between turns, and water cooled.

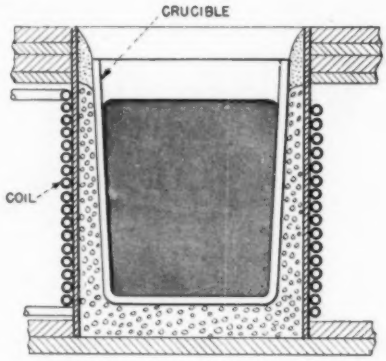
When high-frequency current is applied to the terminals of the helix, all space inside the coil is subjected to a rapidly alternating electromagnetic field, and any electrical conductor inside the coil (i.e., the furnace charge) consequently becomes permeated with induced currents—which cause rapid heating up to the melting point. The action of the electromagnetic force on the molten metal charge keeps the metal stirred up, quickly distributing the elements to all parts of the charge and maintaining alloys in a state of perfect homogeneity for high-speed operations.

A 175-kw. generator supplies current for the furnace, which has a melting capacity of about 500 lb. of steel per hr.

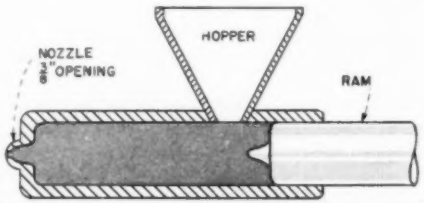
Furnace coils are housed and protected by a metal framework supplemented by external insulation against high-frequency current to insure the safety of personnel. Virtually all heat goes into the melt because induction effects in the framework are minimized by nonmagnetic metal components, which are divided into insulated sections.

A protective pressure switch is incorporated in the water supply to insure an adequate flow of water to the capacitors at all times. This is supplemented by a visual warning system, whereby cooling water can be discharged into a small open trough beside the control panel.

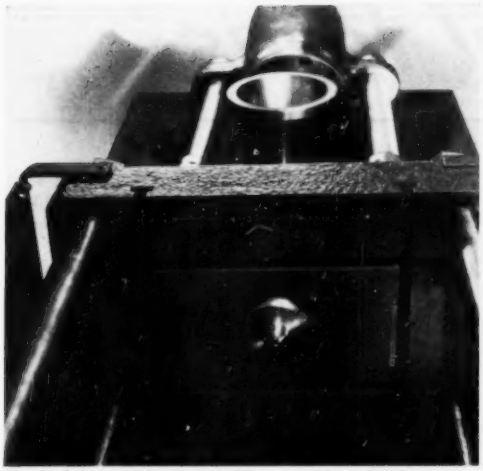
Lining the furnace is a preformed refractory crucible, positioned over a granular refractory bed and centered in the induction coil, sealed at the top with an air-setting refractory cement. The crucible can be readily broken out of the furnace, so the latter can be relined whenever necessary.



Coreless induction heating furnace uses a watercooled copper tubing heating coil. Electromagnetic forces keep molten metal constantly agitated



Injection ram nose is shaped to conform to nozzle opening to eliminate danger of clogging by rapidly cooling steel



Fixed platen of injection molding machine, showing nozzle and feed hopper, with injection cylinder in background

The furnace is movably mounted on double trunnions, and a carefully aligned pouring spout minimizes the possibility of waste in loading the injection machine hopper.

The injection machine was designed by Hisgen Machine Tool Works, Los Angeles, and is 14 ft. long, 5 ft. high, and 4 ft. wide and weighs 7 tons. Its hopper-fed injection cylinder is preheated before loading. On current models this is done by a welding torch but an induction-heated cylinder is currently under development.

The injection ram is hydraulically operated to force the molten steel from the cylinder, through a small nozzle, into a closed mold cavity. The ram has an 18-in. stroke, and the face of the plunger is shaped to conform closely with the inside shape and dimensions of the nozzle end of the cylinder to prevent clogging. The nozzle opening is ⅜-in. in dia., and all parts of the injection mechanism are lined with tungsten-carbide or high-chrome steel for maximum temperature resistance.

Dies are machined from drop-forged chrome-nickel alloy-steel stock, and from the design viewpoint are generally equivalent to those used for die-casting alloys of the intermediate temperature group. One unit is mounted on a stationary platen in front of the injection nozzle, while its mate is set up on a movable rear platen. Both platens are vertically aligned with one another, and the rear platen is moved by a hydraulic clamping cylinder.

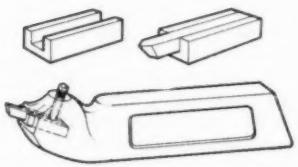
Accessories for the operation of the two hydraulic cylinders are situated in the base of the machine. They include a 120-gal. tank of hydraulic fluid, a 5000-psi. airbrake pump, and a 20-gal. accumulator.

Articles thus far made by injection molding steel range from hypodermic needles to carburetor cases, wrenches, knobs, handles, etc., weights of which vary from a few ounces to about 15 lb. Production estimates reveal that these articles cost an average of 50% less than equivalent items manufactured from steel by more conventional processes.

Not all steels can yet be handled, the limiting factor being the effects of the high temperature on the injection mechanism but those with melting points of 2750 F. or less have given excellent results.

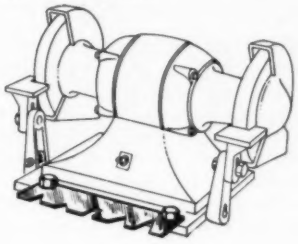
Short Cuts FOR THE SMALL SHOP

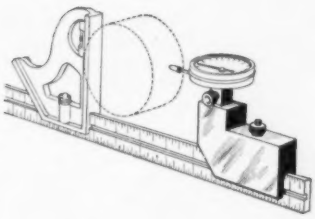
BY A. H. WAYCHOFF



TOOLBIT ADAPTERS for large toolholders makes it possible to use up small bits on light jobs and saves grinding time. For example, make up three adapters with 3/16, ¼, and ⅜ slots for equivalent sizes of toolbits and with the body to suit the toolholder opening.

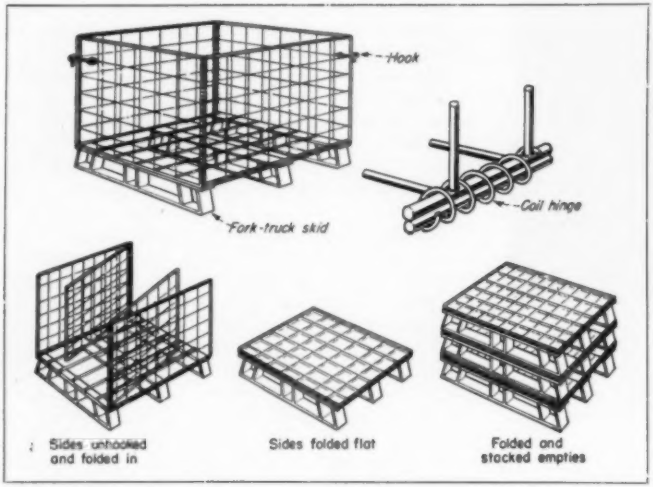
A GAGE on the bench grinder helps to get the correct point angle on drills, the correct angle on thread tools and similar tool grinding jobs. To make a gage, file appropriate notches in one edge of a piece of flat stock and drill two fastening holes. Then fasten the gage to the bed of the grinder.





ROUNDNESS of various objects can be tested with a square and dial indicator. To mount the dial indicator on the scale, make a block with a tongue to fit the slot in the scale. Provide the block with a setscrew for clamping the block at the desired point on the scale. To use, set the dial indicator to the desired size, slip the piece between the square and dial indicator stem and rotate the object. Any out-of-roundness will be detected by indicator movement.

Practical Ideas

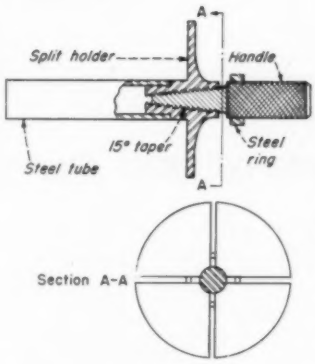


Folding Tote Boxes Release Floor Area for Production

TOTE PANS AND BOXES are due for a change in many plants around the country. This new design is in use where light parts and assemblies must be moved. Unlike the old wooden boxes and solid steel pans, rancid oils cannot saturate the container and finished grinds and polishes cannot be ruined.

The walls and floors are wire, with heavier wires forming the frame. Coiled wires hinge the sides together except where hooks are used. This feature permits collapsing the baskets so they are only slightly higher than the open steel feet. The baskets are easily handled by fork trucks, and empties can be stacked four or five high near a machine.

One outstanding advantage of the baskets is that their weight is much less than that of conventional tote boxes and pans. In plants where they have been tried out they have released 10 to 20% of the operating floor space formerly covered by the old-style storage containers. *Chester S. Ricker, Grosse Point, Mich.*

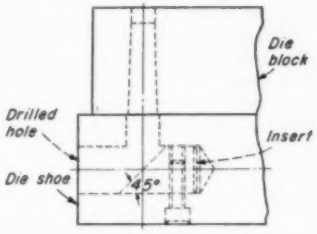


Split Holder Clamps Small Parts for Buffing

SMALL PARTS that cannot be easily handled by themselves at a buffing or polishing wheel are chucked on this split holder. The internal clamp grips in a small bore in the end or face of the part, as illustrated on the piece of steel tubing.

The threads on the spindle and the holder are cut double at a 15° included-angle taper. This makes clamping a quick operation. The steel ring resting on the handle is slipped onto the shoulder of the split holder when it is removed from a part to hold the four sectors together on the spindle.

The holder, which was turned, bored and faced and then cut into four sectors, has two shoulders at the work end, making a double range of diameters fall in the capacity of the tool. Clamping, after the holder has been inserted in the bore of a part, is done by tightening the handle to spread the sections of the holder. *John K. Lukacs, S. Norwalk, Conn.*

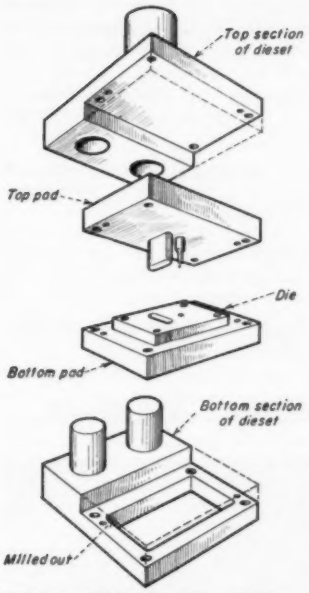


Die Ejects Slugs Without Bolster Hole

WHEN PIERCING holes in stock where there is no hole through the bolster plate for the slugs to pass through, the illustrated method is highly satisfactory for getting rid of the slugs. It is simple to make, and weakens the die only slightly.

A hole about twice the diameter of the pierced hole in the work is drilled in sideways in the die shoe. This intersects the vertical hole and extends somewhat beyond. A round piece of cold-rolled steel is cut off at 45°, then drilled and tapped, and secured in the hole by a capscrew through the die shoe.

As the work is pierced, the beveled edge on the insert causes the slugs to bounce out to the front of the die, from where they can be easily removed. *Roger Isetts, Kenosha, Wis.*



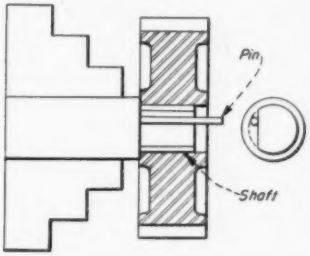
Universal Diesets Save Costs

IT IS STANDARD practice in many toolrooms and die shops to purchase standard diesets and adapt them for each particular purpose by machining them out and drilling holes as necessary. This means that they cannot usually be used again for any other job. But many dies, especially those of nearly the same size, can be mounted in a simple universal dieset that will reduce costs appreciably.

The upper and lower diesets illustrated have been milled out to about half their thickness as close to the guide pins and holes as possible without loss of strength. The lower die is then machined out to leave plenty of clearance space in the middle.

Steel pads are then bolted to the diesets to bring the total thickness back up to normal. Since these pads are simply flat stock, many of them—one for each die setup required—can be made at little cost. The pads are secured with dowel pins to make second setups accurate and easy. The dies are then bolted and pinned to the pads and the press is set up as usual.

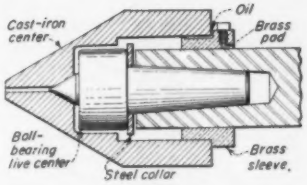
When the operation is completed, both the dies and pads are stored for future use. *Gerhard Wenke, Los Angles, Cal.*



Quick Assembly Chucks Gear

THE I.D.'s of gear hubs we make are too small to be chucked so the hubs can be faced, so we turned a short shaft down to the I.D. and shaped a flat on it. A piece of drill rod is now inserted between the hub and the shaft and it is caught as the gear is rotated back. Release requires only a slight twist.

This is faster than pressing a mandrel on each gear and is a simple operation. The gear is assembled to the shaft by pushing it back to the shoulder, against which it aligns itself. *W. J. Blankenship, Canton, O.*

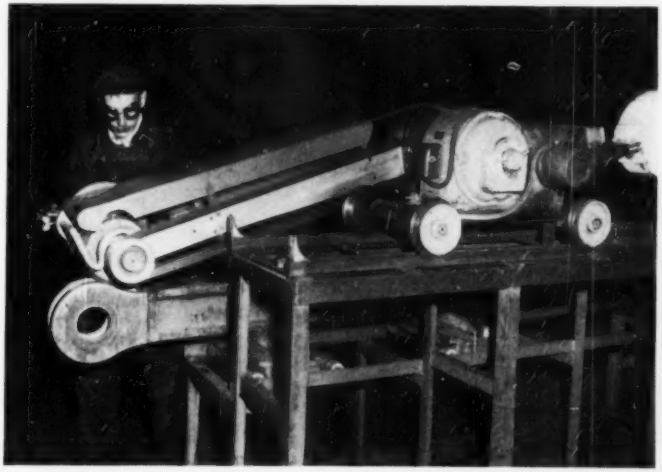


Tailstock Centers Large Pipes

REDUCED OVERHANG and steadiness are the advantages of this extension center for large parts such as pipes or large castings. The center is free, since it depends on a ball-bearing center for support.

A brass sleeve supports the rear end of the center on the outside diameter of the tailstock spindle. This bearing must be oiled through a groove in the sleeve. The tip of the bearing carries the front end of the center in a closely matched hole. A ¼-in. hole is drilled through the tip of the center to avoid any fitting troubles between the center of the bearing and the cast-iron center.

The steel collar is inserted to allow pushing the ball-bearing center off the spindle by backing the spindle into the tailstock. *Thomas Gray, Belfast, N. Ireland.*



Locomotive rods are polished faster by new machine than by old hand grinder. High-speed endless abrasive belt works from rolling motor mount on tracks. All types of rods can be handled. *Southern Pacific R.R., El Paso, Tex.*

Micrometer Height Gage Corrects Measuring Troubles

MACHINISTS who use height gages with attached indicators often observe indicator readings to a ten-thousandth of an inch, completely forgetting that the basic gage itself is no more accurate than to the nearest thousandth. A gage that will prevent wrong reading from this cause is made from a standard micrometer head fitted with a base and a disk.

The stand is lapped on the bottom and has a 1¼-in. opening exposing the spindle. The contact disk is fastened to the spindle by means of a flathead screw countersunk into the disk. Both sides of the disk are lapped parallel and the thickness is made an even dimension, such as 0.100 in. or 0.200 in. When the disk is attached, any inaccuracy of the micrometer head can be corrected by adjusting the thickness of the disk.

The instrument is used with a toolmaker's indicator attached to a surface gage or any other base. The desired height is set on the micrometer and transferred to the work to be checked. Variations in indicator reading indicate that the piece is not to size.

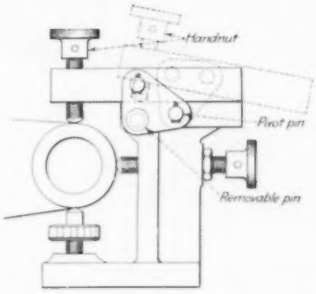
Large dimensions can be checked by using gage blocks under the instrument. Allowance for the thickness of the disk must enter all calculations for setting the gage. *R. Kaden, Elmhurst, N. Y.*

Clamp Clamps Down—But Unclamps Off to the Side

QUICK-ACTING CLAMPS are nothing new, but this one has some advantages over conventional types in that it can be quickly cleared from over the part it holds so that the part may be removed directly upward. This feature is provided by two pivoting link plates.

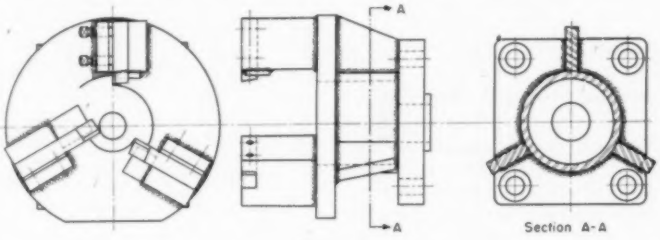
The upper anvil of jaw, a handnut, is threaded in a hole through the clamping arm. This arm is pushed back to rest directly on the body when the part is released, allowing clear removal of the work if movement is restricted in any way.

When the clamp is down, a pin, chained to the clamp, is pushed through the holes in the link plates and through a hole in the body.



Slight adjustment of the handnut holds the part firmly.

An adjustable lower anvil and a side positioning screw were added to the clamp to allow a range of parts to be held. It is easily attached to machine tables. *H. Buckley, Warrington, England.*



Bar Stock Reduced Rapidly With Triple Toolbits

A TOOLHOLDER was fabricated to carry three carbide-tipped tools that made a reduction from 4 in. to 1 in. on a 5-in. length of steel bar. This was a production job that required both ends of each shaft to be reduced rapidly. With the illustrated setup each end was finished with a 0.005-in. tolerance in just under 3 minutes.

Three cutters acted similar to flycutters, except that the load was high and the speed slow. The machine spindle revolved at 223 rpm. and the feed was 0.0075 in. per revolution. Horsepower required was a maximum of 10.

The holder was made from two plates, three joining webs and toolholder blocks, all welded in place. Two small bolts held each tipped tool in position, and small tool-support blocks provided accurate locations for the tools. In order to even out the cutting load, the first tool was set to reduce from a diameter of 4 in. to 3¼ in. The second, aligned 0.030 in. behind the first, reduced to 2¼ in., and the third, 0.030 behind the second tool, reduced the diameter to 1 in. Since each tool carried its own load and all loads were roughly equal, little chattering was caused by the heavy cutting action.

Chip breakers were essential to keep the cutters from jamming. The tool-supporting blocks extended only ½ in. behind the tools to keep the chip clearance at a

maximum. Although it was not essential, the work was chamfered for easier starting. The tools were fed by hand until all were cutting, then the automatic feed was engaged. *D. Moore & C. Johnson, Carnegie, Victoria, Australia.*

Peening Method Increases Life of Shell Reamer

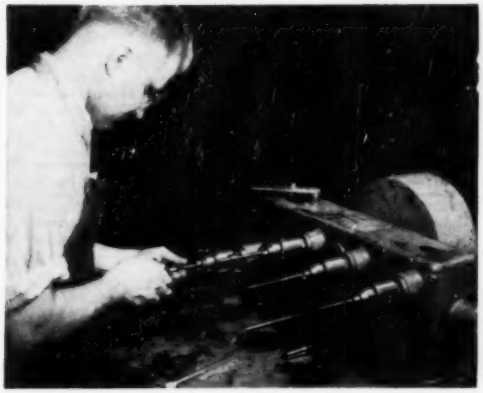
REAMING on a production basis in materials to tolerances of +0.0000 and −0.0003 provided quite a problem. Carbide-tipped reamers were tried, as were single-tip carbide boring tools, but in both cases the carbide tooling was not a success. Whether it was the nature of the material or some other factor that caused the difficulty, I can only guess.

Standard shell reamers, ground and honed, with inserted teeth did work. This tooling was selected with the idea of peening the front end of the reamer as it wore to increase its diameter in mind. One tool has been in operation for two years now, and rejects are rare. Life between resizings runs from 550 to 600 holes.

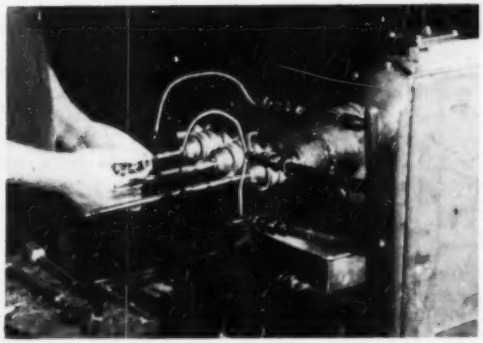
Peening is done with a ball-point punch with a ⅛-in. radius. As the reamer body is soft, a light blow with a hammer under each blade penetrates about 0.012 in. and increases the diameter about 0.001 in. After this operation the reamer is honed down to the required size.

It would be logical to assume that the peening, which actually stresses the high-speed-steel insert, should develop fracture, since only the front end of the blade is affected, which bends and curves it. This has not occurred, and the tool is just as good as new today, and has reamed over 5,000 holes. *W. Brunner, Vancouver, B. C.*

Multiple-Spindle Heads Finish Sewing-Machine Parts



Original multiple-spindle bench unit mounts four Jacobs chucks at 5-in. center distances. One spindle can be reversed for tapping. Parts are hand-held for light cuts

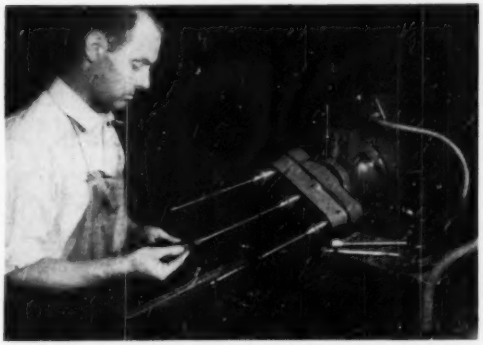


Geared-head bench lathe operates at 360 rpm. and drives four spindles at 180 rpm. Center distances here are 3¼ in. between tools. Long leads support center parts.

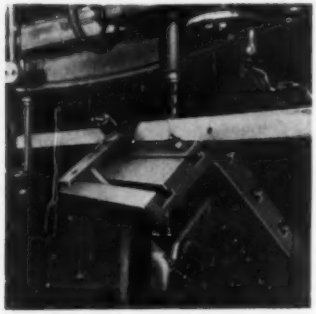
SMALL PARTS for industrial sewing machines go through a number of operations such as chamfering, reaming and spotfacing in the final stages of production. These jobs could be done in standard setups on drills and lathes, but in the interest of speed they are machined on a number of multiple-spindle units on speed lathes and bench drives.

Originally one setup was made with a four-spindle bench unit operating from a ¼-hp. electric motor through a 3-step V-belt pulley drive. Newer units, attached to speed lathes, have been added to handle more and different parts.

Experience with the spindles has shown that little maintenance is required when cutting oils—usually sulphur-based—are employed. *Union Special Machine Co., Chicago, Ill.*



Three-spindle Hoefer head on new installation is angled at 45° with spindles 4 in. apart for clearing parts and operator's hand. Steel, cast-iron and malleable-iron parts are machined

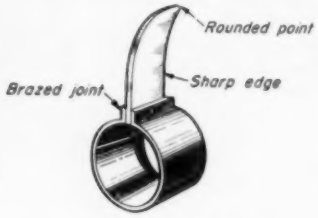


Angle Iron Drilled on Tilted Universal Table

THE UNIVERSAL TABLE of a 4-ft. radial drill is adjusted to a 45° angle so large sections of angle iron can be drilled. Holes through both flanges are drilled in this manner with the flange to be drilled held horizontal by a clamp setup.

A flat bar is bolted to the table parallel with the T-slots to catch the lower edge of the angle and hold it steady. Clamping is done with a spring-release, quick-acting clamp through a cross bar and a pivot bar set in another T-slot.

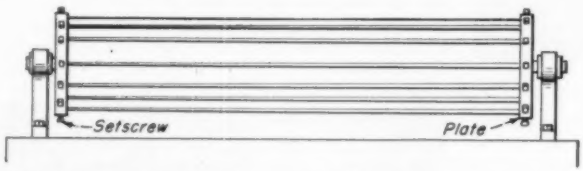
Since the bottom of the top flange rests on the corner of the table, and the lower flange is prevented from moving, the setup is positive. Once it is set for a size of iron, subsequent holes drilled will be perpendicular to the flange they pierce. *S. B. McKay, Phoenix, Ariz.*



Ring Knife Cuts Tying Twine On Electric-Motor Coils

THE NUISANCE of handling shears or knives in shipping rooms and winding departments can be eliminated by this gadget. We employ it for cutting heavy twine for tying electric-motor windings.

The ring, made in different sizes to fit between the first and second joints on a worker's finger, and the blade are both steel. The blade is sharpened on a stone with a rounded point to prevent the tool from damaging clothing or the worker himself. *Laurell F. Roth, Freeport, Ill.*



Salt Bath Puts the Whip into Trout Rods and Antennas

TROUT RODS and auto-radio antennas get their "whip" from being machined with a uniform taper. However, heat treatment is as necessary as accurate machining, especially for making rods that can be bent into a complete circle.

The process of heat-treatment is handled by a two-plate fixture and a salt bath at a temperature of 600 F. A set of rods is ganged in the fixture, mounted under tension and clamped with setscrews around the circumferences of two round plates. Immersion lasts until the rods come up to the bath temperature, which takes 25 min.

Trout rods run from 5 to 9 ft. in length, and the antennas are as long as 16 ft. The drill-rod stock, after being heated, is quenched in an oil bath and final operations are completed. *M. Karge, Brockport, N. Y.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

68TH WINNER:

THOMAS PATELL

Reverse Reamer
Transfers Holes

NEWS OF METALWORKING

Allocations to Take 20 Percent Of Finished Steel Production

WASHINGTON—Political steel allocations programs, domestic and foreign, will be taking about 20% of total finished steel production by March 1. And, if Commerce Department projections of ECA shipments during 1949, made last summer, are anywhere near correct, the cut into steel production will be even heavier.

This is how it works out now:

The voluntary allocations program, with at least 14 programs scheduled for operation before March 1, will take from 10 to 12% of finished steel from the production pie. ECA exports, which took 2% of production during the first six months of 1948, are expected to take about 3.5% in 1949 (if a Commerce Department projection is right). Non-ECA exports, which took about 5% during the first half of 1948, are dropping to a level of about 4.5% for this year.

Where these cuts are going to hurt is in the individual steel commodities. Plate, at the year-end level, was already 42.8% allocated. Structural shapes were 34.5% allocated. Axles and wheels (railroad) were 52.1% ticketed. Tin and terne plate is 16% allocated, pipe and tube 15.3%, bars 13%, ingot blooms and billets 8% and wire and wire products 7%.

Drain Will Increase

By the time the ECA export increase comes into full effect, the drain on plate, shapes and sheet and strip will be considerably heavier.

Domestic voluntary allocations now being set up, to continue until next September, and probably after that if the Taft Act is continued, account for 542,721 tons of steel products a month. By February the figure will be over the 600,000-ton mark. In addition, three lump-sum agreements to provide steel for African manganese ore cars, a natural gas pipeline into the AEC plants at Oak Ridge, and farmers' grain bins, add another 84,000 tons which will come out of the pot during the spring.

Production of mill products should average around 5.5 million tons a month, if all goes well next year.

Here are the voluntary allocations of finished steel now on the books for the next nine months:

Mining machinery, a new program starting in February, 26,400 tons a month. Oil field tanks and production equipment, 16,530 tons a month. Oil tanker production and repair, 40,380 tons a month. Merchant vessel construction and repair increased from the present 10,000 tons to 15,415 tons per month, starting in February. Freight cars, 249,682 tons a month. Barges, an increase from the present 20,000 to 25,000 tons per month, effective in February. The military, 102,505 tons per month. The AEC, a reduction from the present 20,000 to 16,414 tons per month. The joker here is that an additional lump-sum agreement for 25,000 tons has been approved for a gas pipeline to Oak Ridge. The National Advisory Committee for Aeronautics, 1,926 tons a month.

Additional Allocations

Still in the discussion stage, but also slated for continuation after the March 1 date, are:

Warm air heating materials, now 29,122 tons a month. This allocation might be reduced, but it will depend upon what the administration advocates in the way of a national housing program. Prefabricated housing (steel), now running at about 10,000 tons a month, final allocation depending upon the success of Lustron and other steel house builders, and upon the administration's housing program. Anthracite coal mining maintenance and repair, now 2,570 tons a month. Bituminous coal mining maintenance and repair items, now being programmed, but under consideration for a "pooling-of-orders" scheme. This would allow small mine operators to pool needs so as to order in carload lots. Steel producers are not considering orders of less than carlots. Initial request for this category totals 31,000 tons a month. Petroleum terminal storage tanks, not now under the program, but being considered. Original request was for 16,000 tons a month. Another new program, for oil country goods and pipeline pipe, has been submitted but probably will not get by because of the tardiness in getting it presented.

The lump-sum agreements already made include the AEC pipeline (25,000 tons), grain bins (50,000 tons of galvanized sheet), and ore cars for South African manganese production (9,000 tons).

***TRAKLOADER**, weighing 71 tons, has proved efficient on logging operations and large construction projects. Manufactured by Washington Iron Works, Seattle, Wash., it is powered by a 200-hp. Cummins diesel motor and has a rated lifting capacity of 50 tons. It is equipped with a Twin-Disc torque converter, planetary two-speed drive and a 28-ft. goose-neck heel boom*

Makers of Fasteners Expect Thread Unification to Cost $10 Million

CLEVELAND—Production of screw threads under the new unification program will cost manufacturers of fasteners a minimum of $10 million to equip their plants, provided the industry is permitted to ease into the program gradually over a period of approximately five years.

In the event that time is an essential factor and the production of threads under the new standards is demanded at once, the cost would skyrocket. Under the most favorable conditions two years is seen as a minimum when fasteners with standardized threads could come from the industry in large quantity.

This was the opinion of a number of the leading makers of fasteners attending the one-day symposium in Cleveland Dec. 16 on the new American Standard Screw Threads, including the Unified Screw Threads, under the auspices of the American Institute of Bolt, Nut and Rivet Manufacturers.

While final formal approval has not been given the new American standard screw threads, one maker has already been approached by customers for information on availability and cost.

Gage Business Aided

Gage and die makers see excellent business ahead during the transitional period of the fastener industry. A quick and not complete list of new equipment which will be needed in any plant turning out products with the unified screw threads includes new wire drawing dies and gages to check same; new gages to check wire on the heading machines new heading and extrusion dies with gages to match; go and no-go thread gages; and gages for all of the 24 fine-thread sizes and for the 34 coarse-thread sizes.

Along with the headaches in store for the industry, some bright spots were pointed out to the 200 manufacturers at the symposium. The industry will not have the job of selling the unified thread products as the demand will originate with the customer and back of the immediate customer will be the government.

It was pointed out that a large section of present customers will never question the change to the new standard, and the distributors will probably be totally unaware of any difference.

Since the old and new standards will be interchangeable in ordinary use, there will be a minimum of questioning from the average customer during the transitional period. Old inventories will be obsoleted or unusable.

Actually as far as tolerances are concerned, the unified thread limits are revisions in thousands and tenths of thousandths to give a little more working tolerance. There has been some indication from the automotive and kindred industries of their desire to continue the old Class 2 and 3 threads. Larger makers of fasteners, under tentative plans, expect to change over first on the more common items including carriage and machine bolts, stove bolts, machine screws, etc. There will be no problem in the change-over insofar as nuts are concerned since the new standards do not change any basic dimensions or hole sizes but slightly alter the tolerances.

All who attended the symposium agree that handling is to be the greatest problem, starting at the steel mill level.

Machine Tool Definition Changed

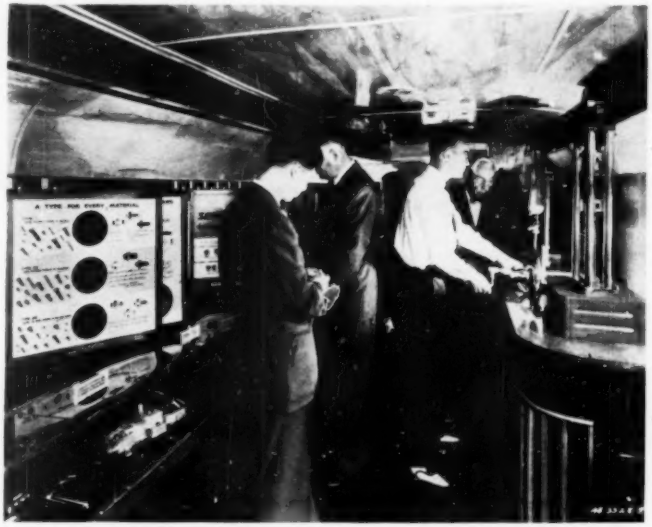
CLEVELAND—Membership in the National Machine Tool Builders' Association will be open hereafter to individuals, co-partnerships and corporations engaged in the manufacture of metal-forming as well as metal-cutting machine tools, Lloyd D. McDonald, president of the association and vice president of the Warner & Swasey Co., announced recently.

An amendment to the constitution of the association has added to its membership qualifications clause this sentence: "A metal-forming machine tool is a power-driven machine, not portable by hand, used to press, forge, emboss, hammer, blank, or shear metal."

This definition does not include die casting machines, extruding machines, rolling mills or welding equipment, Mr. McDonald, who was chairman of the qualifications committee prior to becoming pres., said.

The purpose of the association is now "to promote the lawful interests of the metal-cutting and metal-forming machine tool industry (known as the machine tool industry) in the direction of good business ethics; the liberal discussion of subjects pertaining to improvement, standardization and the methods of manufacturing and marketing tools."

Serving with Mr. McDonald on the committee, whose proposal was adopted by vote of the memberships, were: L. W. Scott Alter, American Tool Works, Co., Cincinnati; Swan E. Bergstrom, Cincinnati Milling Machine Co.; Rudolph W. Glasner, Clearing Machine Corp., Chicago; Victor W. Peterson, Hannifin Corp., Chicago, and Thorvald S. Ross, Rivett Lathe & Grinder, Inc., Boston.



***TRAVELING LABORATORY** to demonstrate modern fastening methods has been launched by Shakeproof, Inc. A special automatic trailer carrying the exhibits will be available to manufacturers, educational institutions and professional groups*

Labor on Automatic Screw Machines Led Machine Tool Industry in '47

WASHINGTON — An average of 3,200 man-hours per unit were expended in 1947 in the manufacture of automatic screw machines, according to a survey by the Bureau of Labor Statistics. Turret lathes and horizontal boring machines required about 2,800 man-hours per unit.

Man-hour requirements were much higher for these two groups than for any other types of machine tools studied. Simpler tools such as upright drills and surface grinders required only about a tenth of the number of man-hours per unit needed for the more complicated tools.

The average number of man-hours expended for various selected types of machine tools in 1947 follows:

Automatic Screw Machine	3,215
Turret Lathe	2,853
Horizontal Boring Machine	2,786
Milling Machine	1,740
Engine Lathe	1,106
Shaper	811
Tool and Cutter Grinder	741
Radial Drill	598
Surface Grinder	351
Upright Drill	289

The survey reveals that man-hours expended per unit for all reported machine tools combined were 10% higher than the averages for 1939 and 7% above those of 1945, the last year for which data was presented in the Bureau's initial report on man-hour requirements in this industry. The rise from 1945 to 1947, which was directly traceable to the sharply lowered volume output, continued a trend begun in 1941 when man-hour requirements were 10% below those of 1939.

Indirect Labor Up

Indirect man-hours rose somewhat sharply during the 1945 to 1947 period than might have been expected from the market decline on production. This was due in part to the elimination of wartime overhead functions no longer required (such as plant protection and in some instances, production and materials controls) and in part to a switch to the prewar practice of assigning job functions such as machine set-up or tool handling to machinists (direct labor) rather than to machine set-up men or toolroom men (indirect labor).

A few continuing technological improvements tended to prevent such severe rises as might have occurred otherwise. The improvements included even wider application of carbide-tipped tools, introduction of powered tools in some plants for work formerly done by hand and purchase of a limited number of automatic, high-production machines.

Ratio Varies

An analysis of the ratio of indirect (overhead) labor to total factory labor in the reporting establishments revealed a wide range. This was due to a number of reasons, including differences in manufacturing procedures, in the scale of operations, in nature of products, and in classification of accounts. More than half of the firms reported ratios of indirect labor to total labor falling between 21% and 50%; over two-thirds reported ratios between 21% and 60%; and less than a tenth reported ratios in excess of 60%.

Study of Titanium Seen Vital

WASHINGTON—The high strength, weight ratio, resistance to corrosion and high temperature characteristics makes titanium an important metal to study for structural material, Captain W. H. Leahy, ONR assistant chief for research, stressed at a symposium on the new metal which was sponsored by the Office of Naval Research.

"Its natural abundance in the U.S. is also a reason for giving it careful consideration," Capt. Leahy told more than 250 representatives of government agencies including the military, industry and academic laboratories attending the Dec. 16 session.

The large attendance and the interest in the question periods indicated the growing importance to industry of a metal which with its alloys was predicted as most nearly fulfilling the requirements for an all-purpose metal.

On the commercial exploitation of titanium, several speakers indicated that this hinges primarily on the stimulation of demand for the metal by developing various applications for it. The technical problems were not considered discouraging to its use.

A number of possible applications for the material or its alloys were indicated by N. E. Promisel, Bureau of Aeronautics, Navy. Among them, the substitution for aluminum and magnesium alloys and steel in some types of aircraft construction and substitution for steel where space is at a premium.

Gear Capacity Sought

PITTSBURGH—The American Gear Manufacturers Association, for the purpose of supplying the National Security Resources Board with information, has launched a survey to determine the gear capacity of the nation.

Manufacturers with excess capacity for producing gears and gearing products who have not received survey forms are requested to write to the AGMA for them. The survey is in two parts: one requests information on gear and gearing products manufactured and the other on gear-cutting tools available.

The survey warns the industry that since it is now operating at near capacity another national emergency would place a severe strain on the industry's ability to produce necessary gears and gearing products.

A. S. Keller Appointed Senior ECA Officer

Alexander S. Keller, vice president and manager of foreign sales, Pratt & Whitney, Division of Niles-Bement-Pond Co., West Hartford, Conn., has been appointed senior industry officer in the Netherlands Mission of the Economic Cooperation Administration.

The company has granted Mr. Keller a leave of absence to be the representative of the United States under Dr. Alan Valentine, chief of mission, and president of the University of Rochester. Administration of the industrial phases of ERP in the Netherlands and Netherlands Indies will be Mr. Keller's assignment. He will leave for The Hague late in January.

Mr. Keller's leave from the West Hartford company has been granted for approximately a year.

Meetings

Grinding Wheel Institute and **Abrasive Grain Association,** Jan. 27-29, Edgewater Beach Hotel, Chicago

American Society of Tool Engineers, March 10-20, Hotel William Penn, Pittsburgh

Magnesium Association, April 14-15, Edgewater Beach Hotel, Chicago

British Top World on Export of Autos

***NEW VELOX** and Wyvern models roll along the assembly line in the Vauxhall factory. The company spent more than $2 million for new machine tools*

LONDON—Britain, second largest automobile-producing nation, took over the lead from the United States last year in car exports. This was accomplished despite shortages of key materials—especially steel—which held the industry back to 60% of total capacity.

With some 1,000 passenger cars rolling off British lines, the industry is shooting for higher marks with a broad retooling program.

British manufacturers got the jump on the U.S. in many foreign markets immediately after the war. While American manufacturers were tooled up to produce superior new postwar models, most British firms simply took their prewar tools out of storage in 1945 and began turning out 1939 models to fill the pent-up demand for cars. They seized upon the opportunity to put British cars into markets formerly supplied by Germany and Italy. And they found new markets in many countries that have excess sterling but no dollars.

Service Stores Opened

Building up a world-wide chain of servicing facilities and overseas stores of spare parts, the British plan to hold on to the edge they have gained. One real cause of worry, however, now mars their prospects: they fear that their invasion of the American market may create a big enough demand for small cars in the U.S. to tempt one of the large American manufacturers into the small-car field.

British cars proved especially popular on two counts: (1) easy to park in crowded city traffic and (2) low-operating costs. The United States is now importing over 3,500 a month.

Britain's desperate lack of dollars has led to many government regulations that vitally affect the auto industry. To earn more foreign exchange for the country, British machine-tool manufacturers are required to export 60% of their output. The remaining 40%, which must be divided among all branches of British industry, is barely sufficient to provide for current replacement of worn-out units. This residual output for home use (about $50 million worth annually) means an average life of over 40 years for existing machine tools. It does not permit the progressive modernization needed for British cars to remain competitive in world markets.

Machine Tools Restricted

At the same time, the government has restricted import of American machine tools. Before the required import license will be granted, a car manufacturer must prove that no British machine tool is available which can do the same job. Most of the motorcar firms, however, have had little trouble proving their need for such superior new American Tools as Gleason's No. 8 straight bevel revacycle machines, Fellows multiple gear generators, Bullard's 8-spindle vertical automatics and high-production multiple drills.

Most firms have kept on producing their old models while tooling up for new ones. Vauxhall, after spending almost $2 million on new machine tools and equipment for its 1949 Velox and Wyvern cars, kept turning out the old models this past summer until July 17 when most of its workers went on vacation. Then a skeleton force of 2,000 men finished putting in the jibs and equipment necessary for the new models. The first 1949 car rolled off the assembly line on August 3—the same day the men returned to work. Similarly, Jaguar continued its production while spending $400,000 on new tools since the war—including such American tools as rotary surface grinders from Arter Grinding Machine Co., Worcester, Mass., and multiple-spindle automatic lathes from Bardons & Oliver, Inc., Cleveland, Ohio. The new 1949 Jaguar sports model is in such demand that 1,600 cars from this year's production have been sold to the American market.

$20-Million Plant Built

Standard Motor Co., however, began from scratch to tool up its plant at Coventry—at a cost of well over $20 million—to start production of its Standard Vanguard last year as a completely new car. The Vanguard was designed especially as an export model to meet the requirements of the maximum number of foreign countries, without any consideration of British laws that have previously kept down size and horsepower of models produced for the home market. And, to get the volume output needed to keep production costs down, Sir John Black of Standard undertook to make tractors for Harry

New Look In Cars

LONDON (McGraw-Hill World News)—Many of Britain's luxury class cars have been given a new look in their 1949 body styles, with little change in engine design. These include such cars as the Humber Pullman and Super Snipe, both made by the Rootes Group. The Rover Co., on the other hand decided against "face-lifting" its body and rebuilt its engine instead.

Labor Front Peaceful

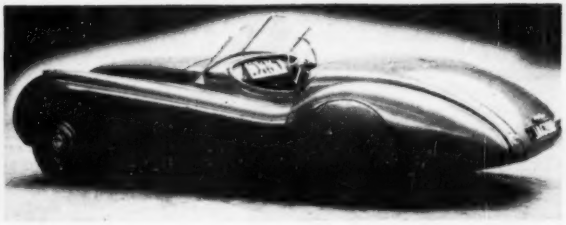
LONDON (McGraw-Hill World News)—The British auto industry on the whole has not suffered from labor troubles since the war. A few spot strikes have been quickly settled. Good wages, convenient working hours and steady employment explain this situation.

While other industries have been hampered by the general scarcity of labor, the auto industry has found and kept workers. Workers are even in surplus as a result of the curtailment in production forced by material shortages.

Newly-designed Standard Vanguard

Vauxhall Wyvern, 1949 model

Higher-Powered Austin

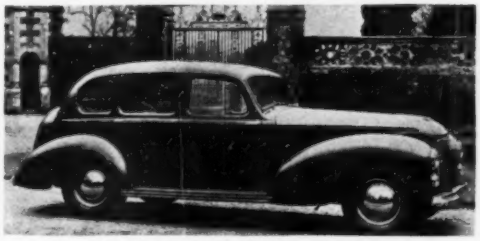


Latest Jaguar Sports Model

Post-war Hillman Minx

Small but spacious Morris Minor

Low-powered Humber Hawk



Sleek, new Humber Super Snipe

Ferguson, using the same engine and rear axle for the car and the tractor.

A few small specialist firms, such as Jowett Cars Ltd. of Bradford, Yorkshire, could shift into the manufacture of new models without tooling and die-making for long production runs. Hence they came out with a trickle of new cars as early as mid-1947. But the widespread introduction of new models was deferred until last Fall. Most of them emerged for the first time at the Motor Show in October. Morris and Wolseley were the last to be announced, just before the Show. The only two "baby" cars left are the Ford Anglia and the new Morris Minor.

Britain's 1949 passenger cars represent a break from former British styles. In over-all design, the chief features are the increased strength of the chassis and the predominance of higher-powered engines. With the exception of Nuffield's Morris Minor (31 bhp.), all new cars of the "Big Six" manufacturers (Nuffield, Rootes, Austin, Ford, Standard and Vauxhall) have increased engine power but added no weight. This combination should give economy of operation and better all-round performance. It has been accomplished by shorter wheelbase, lighter and stiffer frames, and, in a few cases, by incorporating the body and chassis.

British auto manufacturers are still uncertain whether their moves to pool technical knowledge and increase production efficiency will stave off eventual nationalization—or whether further integration would only make it easier for the government to take over. The handwriting, they fear, is already on the wall. This fear is partially based on the fact that if the steel industry's present all-time-high efficiency cannot block nationalization this year, what hope can private car manufacturers have of staying free after 1950? Manufacturers firmly believe that cars can be turned out most efficiently if the industry remains under private control. (McGraw-Hill World News)

Detroit

INCREASED AUTOMOTIVE DEMAND FOR TOOLS EXPECTED... TONE OF OPTIMISM NOTED ON 1949 OUTPUT... EMPLOYMENT HOLDING

As the turn is made in the new year, there are some signs of brightening on the distant horizons of the machinery and equipment manufacturers.

Most interesting is the indication that both General Motors and Chrysler appear to be swinging away from prewar practices in body interchanging. As has been no secret in the trade, General Motors utilized three practically identical bodies before the war to cover most of its line of Chevrolets, Pontiacs, Oldsmobiles, Buicks and Cadillacs. Chrysler, too, largely interchanged body components in manufacturing its Plymouth, Dodge, DeSoto and Chrysler cars.

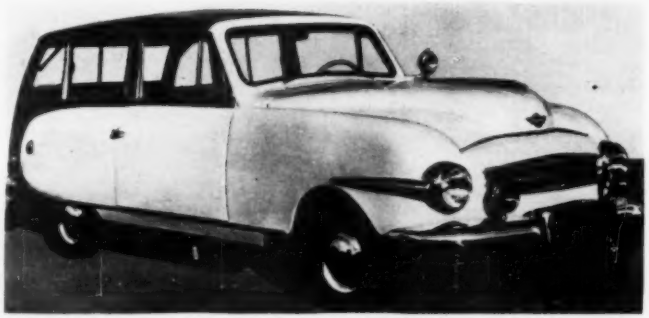
Now, however, the close identity of models within the families is being modified, as it was in Ford-Mercury-Lincoln this past year. In General Motors a remnant of the old "B" body line is appearing on Buick, Olds, Pontiac and Chevrolet. But it is more a remnant of standardization than an example of it. Although the bodies are largely similar, they vary enough to require separate die sets for many of their components.

Four Chrysler Changes

Similarly, the four Chrysler automobiles are subject to changes for 1949 which are much more widespread than in previous years. Each will have much more identity, therefore, than ever before. This is good news, naturally enough, for die-sinking companies. There's more work for them to do.

For machine tool companies, a broader vista holds true on transmissions. There exists today the Hydra-matic and the Dynaflow in the G.M. line. Beyond those well-established transmissions, Packard is tooling for one of its own, already announced. Unannounced is the fact that one company is in advanced stages of development on a new device which provides the automaticity of either of the G.M. units, along with the economy of the orthodox geared transmission. Unannounced also is the development work going on at a satisfactory rate by another company on a mechanism which is projected for sale around $100 or so —definitely cheaper than the others in the field. Also unannounced is progress being made in development of a transmission for Lincoln and Mercury, which are on the verge of tooling for a device of their own.

Beyond the work of this sort is the fact that there is rumored to be a resurgence of interest in lighter, lower-priced cars—an outgrowth of growing buyer resistance to price tags on present models. This work is being done not only by the present manufacturers in the field (one of whom is about to give a quiet go-ahead for a brand-new line which will appear in 1950) but also by others who are contemplating entry into the automobile industry. On this latter score, the gossip is shadowy indeed, but the program is known to embody some production ideas, aimed at reducing costs, which are definitely remarkable.



PLAYBOY STATION WAGON -*With a new financing program underway, Playboy Motor Car Corp., Buffalo, expects to resume production of its convertible and to assemble the new station wagon from sub-contracted parts. Price of the station wagon will be about $1500. Principal specifications: 96-in. wheelbase, weight 2350 lb., 4-cyl. Hercules engine, economy 25-30 mi. per gal., seating capacity 4 passengers*

Year-end reviews released by automotive figures were uniformly optimistic, although Henry Ford II expressed belief that a buyer's market may be "not too far away." His company's output in 1949, he said, would exceed that of 1948 by a modest degree. Hudson's A. E. Barit noted that his company's sales volume in 1948 was the largest in Hudson history; he predicted continuing strong demand for autos. Packard's George T. Christopher anticipated that this year, the company's golden anniversary, would provide greater achievement than 1948, which was the second-best output period in Packard history.

Writers Optimistic

This general, measured optimism was echoed by Detroit automotive writers at their annual Christmas luncheon, during which they filed their predictions for 1949 production. These projections averaged 5,460,234 cars and trucks.

Output since the first of the year has tended to support these warm anticipations. After settling down to the range of 90,000 or so during the holiday period, it stirred itself as soon as full 5-day weeks started, and advanced above the level of 100,000 again. Ahead, as interruptors to the coarse of these operations, are shutdowns in the Chrysler plants for changeovers; but no other major hurdles are in sight—barring, of course, the intermittent stoppages while steel supplies are replenished.

The industry produced a total of 5,282,000 cars, trucks and buses in 1948, the second time in history that more than five million units have been built in a single year. The total is 10% above 1947 and only 76,000 units short of the alltime record set in 1929. A total of 3,911,000 passenger cars were built, the third highest annual output.

Employment Holding Up

Employment is keeping step with this satisfactory picture. During December, last period of record by government agencies, Detroit unemployment reduced to postwar low levels. Currently payrolls seem to be standing up well; the layoffs in other industries have not yet communicated themselves importantly to the automotive field. However, there are signs of worry on the fringes of the industry in the parts plants. Some feel that their customers have built inventories which will slow down order releases before long. A few others have already been cut back on this account, and have laid off men as a result.

Names in the News

James W. Moran

C. Van Deusen

James W. Moran has been elected president of the Baker-Rauling Co., succeeding **E. J. Bartlett,** who continues as a director. The Cleveland concern manufactures power industrial trucks.

Roger Hubbell has been appointed district sales engineer for the Threadwell Tap & Die Co., Greenfield, Mass., and will cover the New England territory.

Bernard H. McGuiness, for three years works manager of the Passaic, N.J., plant of Hewitt-Robins Inc., materials-handling machinery manufacturers, has been appointed vice president of the company's Robins Conveyors Division.

William C. Jordan, vice president and general manager of Wright Aeronautical Corp. and former general manager of the Curtiss-Wright Airplane Division, was elected president and director of both Curtiss-Wright and its subsidiary, Wright Aeronautical Corp.

Leo E. Jacobs has resigned as executive vice president and director of Charles H. Besly & Co., Chicago, to become president of Titan Abrasives Co., Chicago. The Besly company has been the exclusive distributor for Titan for more than 25 years. Other changes in Besly executives include: executive vice president, **K. Y. Taylor,** formerly vice president in charge of manufacturing; vice president and secretary, **W. C. Olson,** comptroller; vice president, **Everett Addoms,** formerly sales promotion manager; Treasurer, **H. G. Haarz,** formerly assistant treasurer.

Cornelius Van Deusen has been appointed assistant sales manager of the V & O Press Co., Hudson, N.Y. During the past two years he was sales and service engineer covering the central west territories.

Harry Crump, for the past year manager of Cutting Tools Sales Engineering, Carboloy Co., Inc., Detroit, has been named assistant to the sales manager. **J. S. Gillespie,** formerly in charge of Wear Parts Sales Engineering, has been appointed manager of Tool and Wear Parts Sales Engineering. **A. F. Dobbrodt,** formerly Special Products Sales Engineer, has been advanced to manager of Mining Sales Engineering.

Ruel T. Cadwell has been named president, succeeding **Charles T. Holcroft,** of the Holcroft & Co., Detroit, manufacturers of heat treat furnaces. Mr. Holcroft, founder of the company, remains as secretary and consultant on design. Other appointments include: **Walter H. Holcroft,** executive vice president; **C. H. Martin,** vice president in charge of the Chicago office; **Robert H. Cadwell,** treasurer, and **A. W. Criger,** assistant secretary.

Robert Hutchinson has been appointed application engineer in the central district with headquarters in Cleveland by Kennametal Inc., Latrobe, Pa.

Robert M. Arnold, a director, has been appointed to a new vice presidency of the Allegheny Ludlum Steel Corp. Mr. Arnold is also president of Arnold Engineering Co., Chicago, a wholly-owned subsidiary.

G. Waine Thomas has been named chief engineer of automotive, truck and industrial engine divisions of Continental Motors Corp., Muskegon, Mich.

James Cochran has been made assistant chief inspector of Plymouth Detroit plant.

Max M. Monroe, assistant to **E. R. Godfrey,** General Motors vice president, has been named acting general manager of the Aeroproducts Division, Dayton, Ohio, succeeding **W. J. Blanchard,** recently killed in a plane crash.

R. E. Carpenter has been named president of the Dana Corp., succeeding **C. A. Dana,** who has been named chairman of the board. Other elevations in the organization, made at the annual Dana organization meeting in New York, are: vice president and secretary, **J. V. Melick,** formerly secretary-treasurer; treasurer and assistant secretary, **L. L. Melick,** formerly assistant secretary and assistant treasurer.

Ralph B. Divins has been elected vice president of the Inshield Die & Stamping Co., Toledo, Ohio. Inshield recently moved into its new plant at 1931 Manhattan Blvd.

Harold E. Churchill

Harold E. Churchill has been named director of research in the engineering division of the Studebaker Corp.

BUSINESS ITEMS

General Electric Co. has opened a new $2.5-million plant at Circleville, Ohio, for the manufacture of slimline fluorescent lamps. When in full operation approximately 500 will be employed with 80% women.

Standard Thomson Corp., Dayton, Ohio, has moved the die casting and experimental engineering division to 930 S. Ludlow Street.

Lukens Steel Co. is planning to electrify the world's largest plate mill at Coatesville, Pa., which has been operated on steam engines and boilers since its completion 30 years ago.

American Flexible Coupling Co., Erie, Pa., has named the firm of **Ehret & Kinsey**, Chicago, as sales engineers.

J. K. Smit & Sons, Inc., will be moved into a new plant in Murray Hill, N. J., by Feb. 15. The New York address of the firm should be used until further notice.

Penn Rivet & Machine Co., Milford, Conn., formerly **Penn Rivet Corp.**, is changing its corporate name to the **Milford Rivet & Machine Co., Penn Division.**

All-State Welding Alloys Co., Inc., has moved into its new headquarters building at 273 Ferris Avenue, White Plains, N. Y.

White Sewing Machine Co., Cleveland, has purchased from the **Jack & Heintz Precision Industries, Inc.**, the Berea Road Plant, West 117th Street and Berea Road, Cleveland. White will not take possession for some time and Jack & Heintz will continue at this location for the present.

Wheelco Instruments Co., Chicago, has opened a new district office at 2204 Fannis St., Houston 5, Texas. George Hatfield, formerly of the company's Chicago sales office, will be in charge.

Hammond Machinery Builders, Inc., Kalamazoo, Mich., has opened a new office at 1021 East 8th Street, Los Angeles 21, Calif. E. C. Hammett has been appointed western representative.

Doehler-Jarvis Corp., has purchased nearly all of the die casting equipment of the **Gerity-Michigan Corp.**, Adrian and Detroit, Mich., for installation in Doehler-Jarvis' plant in Toledo. Gerity-Michigan's Detroit plant will be closed and production of die castings discontinued.

United Steel Sales Co., Detroit, a steel warehousing and processing firm, outbid all others with an offer of $311,000 for the $1,250,000 war surplus Navy Building at the National Supply Co., Toledo. The company will use the Toledo facility for a warehouse or will resell it.

Hamilton Manufacturing Corp., Columbus, Ind., world's largest manufacturer of household stools and utility tables, will break ground this week for a branch factory at Weirton, W. Va.

***ELECTRONIC** "slide rule" solves problems of motion just as fast as it takes for the motion to happen and gives the answers in a steady stream on a special tape. The computer was designed and built by the Goodyear Aircraft Corp., Akron, Ohio*

Hydraulic Equipment Co. has announced the establishment of a sales office in the Industrial Office Bldg., 1060 Broad St., Newark 2, N. J.

Pryor Manufacturing Co. of Mansfield, Ohio, precision specialists in the tooling and engineering fields, announced it has acquired majority ownership interest in the **Hycon Manufacturing Co.**, Pasadena, Calif.

Waldrip Engineering Co., Los Angeles, manufacturers of oil well drilling and servicing rigs, will increase its capitalization from $1,000,000 to $2,000,000 to finance expanding production.

Revere Copper and Brass, Inc., has begun production in its Riverside, Calif., plant. The plant, which was acquired early this year, has been tooled up to manufacture Revere ware, copper clad stainless steel cooking utensils.

Joseph H. Rinehart, Jr. and Monnier Tool and Supply Co. have merged as the **Rinehart and Monnier Industrial Supply Co.**, in Springfield, Ohio. The firm will sell at wholesale a complete line of nationally-advertised cutting tools and die supplies.

Beckett-Harcum Co., Wilmington, Ohio, has moved into a new building in Wilmington. The company, less than a year old, developed and patented a new type air valve which greatly improved the use of air in many manufacturing processes.

Worthington Pump and Machinery Corp. announces that beginning on November 29, 1948, the manufacturing and distributing activities of its subsidiary, Ransome Machinery Co., will be conducted by the parent corporation.

C. M. Murray Limited, 306 Foy Bldg., Toronto, Ontario have been appointed exclusive representatives for **Hydro-Line Air and Hydraulic Cylinders and Special Machinery** in the Provinces of Quebec and Ontario in Canada.

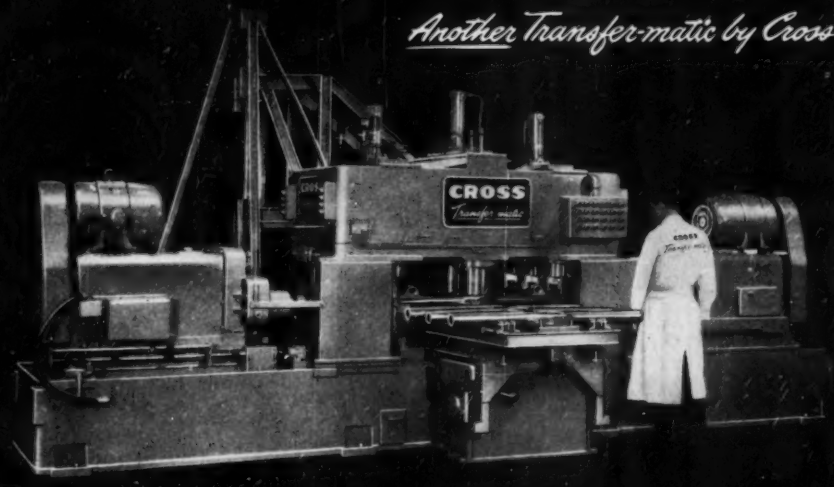
Richards Machine Tool Co., manufacturers of RIMAT Machine Tools and Micrometers will hereafter be known as **Rimat Machine Tool Co.** The plant and offices of the company have been moved to new and larger quarters located at 1117 Air Way, Glendale 1, Calif.

OBITUARIES

Chauncey P. Goss, Jr., vice president and a director of the Scovill Mfg. Co., Waterbury, Conn., died Dec. 19. Mr. Goss, who worked through most of the departments of the company before becoming an executive, would have been 70 years old on Christmas day. He had been employed by Scovill for nearly 50 years, starting on graduation from Hotchkiss School.

John E. Morris, 69, retired machinist and designer, died Dec. 12 in Columbus, Ohio. Formerly employed at the old Case Crane Mfg. Co., he later operated his own machine shop where he remained through the war.

Another Transfer-matic by Cross



Bores and faces 3 types of axles —without set-up

- ★ 280 parts per hour at 100%
- ★ At Station 1, 3 pieces of any size part are loaded; at Station 2, both ends are bored and faced; at Station 3, parts are sorted and placed on conveyor
- ★ 3 pieces at a time automatically transferred from station to station
- ★ Set-up changed automatically for size of part

Established 1898

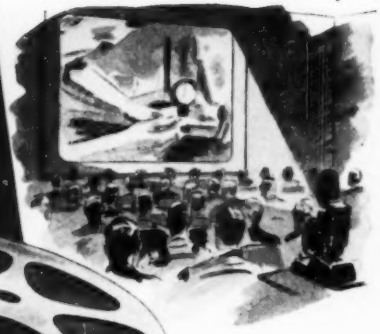
THE CROSS CO.

DETROIT 7, MICHIGAN

SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

Another Contribution To Better Precision Measuring
BY THE
WORLD'S GREATEST TOOLMAKERS



Educational, Instructive, Entertaining

A "MUST" FOR YOUR TRAINING PROGRAM

THE NEW STARRETT MOVIE

"THE TOOLS AND RULES FOR PRECISION MEASURING"

FEATURING

- Highlights in the history of precision measuring
- New Tools and Instruments just introduced by Starrett
- Precision Measuring from basic rules to latest precision methods
- New, simplified instruction: How to use and read the Micrometer and Vernier

Here is a motion picture of vital interest to shop executives, mechanics, apprentices, vocational students — to all who play a part in modern precision production. Tells the absorbing story of precision measuring in 30 interest-packed minutes . . . how precision tools control quality in mass production . . . showing the latest methods and equipment in practical use. This inspiring, educational film will help everyone to do a better, faster job of precision measuring. It's a "must" for apprentice training and shop classes. Arrange today for a free showing to your group. Fill in the coupon. Mail it today.

FOR FREE SHOWINGS TO YOUR GROUP MAIL THIS COUPON TODAY

TRADE MARK
Starrett
REG. U. S. PAT. OFF.

Standard of Precision

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS · DIAL INDICATORS
STEEL TAPES · HACKSAWS AND BAND SAWS
PRECISION GROUND FLAT STOCK

Buy Through Your Distributor

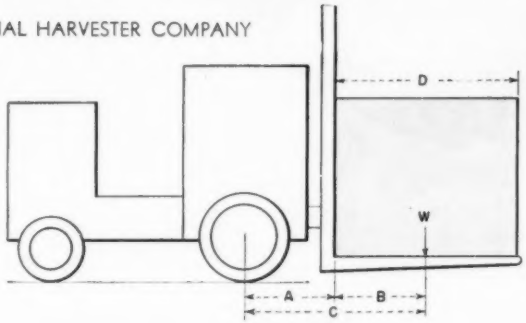
THE L. S. STARRETT COMPANY C
ATHOL, MASSACHUSETTS

Please arrange for our free showing of the new Starrett Movie

Type of Group ..... Size .....
Name .....
Position .....
Company .....
Address .....
City ..... Zone .... State .....

Comparative Rating of Fork Trucks

COURTESY INTERNATIONAL HARVESTER COMPANY



SOME FORK-TRUCK ratings are expressed in pounds capacity with a particular length of load; others in pounds capacity at a given number of inches from the heel of the fork. Some give an inch-pound rating based on the distance of the load center from the heel of the fork, while others base their inch-pound rating on the distance from the center of the load to the center of the front axle. To clear up confusion resulting from these variations, a general method whereby all trucks can be rated on a comparative basis is presented.

It is first necessary to obtain the "Inch-Pound Rating." This can be done in *only one way* and is found from the following formula,

$$R = W \times C \qquad (1)$$

where,

R = inch-pound rating
W = rated load (lb.)
C = distance from center of front axle to center of load (in.)

$$C = A + B \qquad (2)$$

A = distance from center of front axle to heel of fork (in.)
B = distance from heel of fork to center of load (in.)
D = length of load (in.)

With this formula it is then possible to convert the capacities of all trucks to the same load length, thus permitting direct comparisons among different models.

A Typical Example:

Assume that one truck is rated at 4000 lb. at 30 in., which means that a 4000 lb. load has its center 30 in. from the heel of the fork; in other words, $W = 4000$ lb. and $B = 30$ in. Specifications show that $A = 15$ in. From (2) and (1):

$$C = A + B = 15 + 30 = 45 \text{ in.}$$
$$R = 4000 \times 45 = 180{,}000 \text{ in. lb.}$$

Assume the rating on the second truck is 4000 lb. at 15 in.; $W = 4000$ lb. and $B = 15$ in. To further complicate the situation, the distance A is usually different. In this case, assume $A = 12$ in.

$$C = A + B = 15 + 12 = 27 \text{ in.}$$
$$R = 4000 \times 27 = 108{,}000 \text{ in. lb.}$$

Because the distances from the center of the axle to the heel of the fork differ for each truck, a direct comparison of inch-pound ratings does not give a true comparison. Therefore, it is necessary to convert their capacities to the same load center.

Assuming a load center distance of 30 in., the first truck will carry a load of 4000 lb. By use of the formulas, the second truck also can be converted to a 30 in. load center: let the distance from the heel of the fork to the center of the load equal B', which equals 30 in. Then,

$$C' = A + B' = 12 + 30 = 42 \text{ in.}$$

Substitute in (1) and solve for W:

$$W = \frac{R}{C'} = \frac{108{,}000}{42} = 2571 \text{ lb.}$$

Thus, for a load with center 30 in. from the heel of the fork, the first truck will lift 4000 lb. compared to 2571 lb. for the second.

Other Applications

Once the inch-pound rating is calculated it becomes a constant for that particular truck. Then, if it is necessary to know, (a) the maximum load length for any given load, or (2) the maximum load for any given load length, the inch-pound rating formula can be reversed to give this information:

$$C = \frac{R}{W} \qquad (3)$$

$$W = \frac{R}{C} \qquad (4)$$

For example, truck one, above, has a rating of 180,000 in. lb. It is desired to know how long to make a pallet that will have a gross weight of 2500 lb.

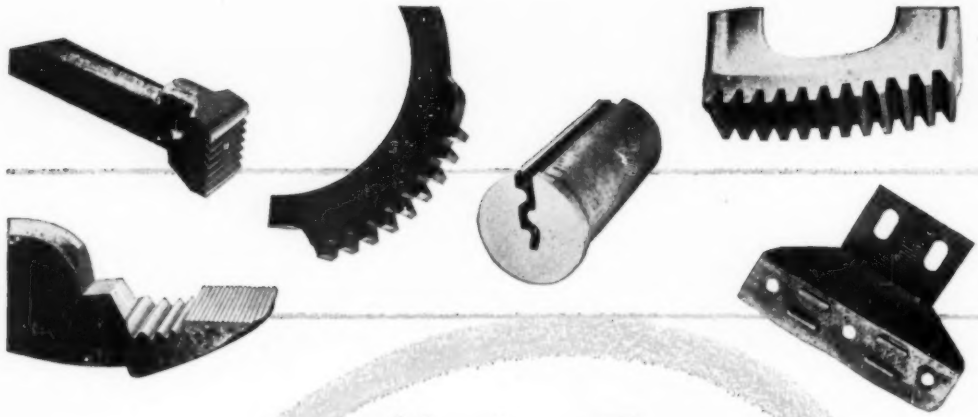
$$C = \frac{R}{W} = \frac{180{,}000}{2500} = 72 \text{ in.}$$
$$B = C - A = 72 - 15 = 57 \text{ in.}$$
$$D = 2 \times B = 2 \times 57 = 114 \text{ in.}$$

The allowable load length then becomes 114 in.

Assume for a rack 84 in. long that it is necessary to know the maximum load that can be placed on it for safe handling by the same truck.

$$B = \frac{D}{2} = \frac{84}{2} = 42 \text{ in.}$$
$$C = A + B = 15 + 42 = 57 \text{ in.}$$
$$W = \frac{R}{C} = \frac{180{,}000}{57} = 3158 \text{ lb.}$$

The gross weight that can be allowed then is 3158 lb.



Machine Faster—

TEETH, SERRATIONS AND SLOTS

Slots, serrations, teeth, flat and curved sections are all being surface broached on many jobs faster, more accurately and at less cost than they had formerly been machined. Surface broaching is applicable to steel, cast iron, bronze, copper or aluminum parts. Machines may be tooled up for one specific operation but in many cases more than one part can be surface broached on one machine by using additional sets of tooling. May we work with you in finding where Footburt Surface Broaching Machines can save you money in your plant?

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building

FOOTBURT *Surface Broaching*

FOOTBURT PATENTED TOOTH FORM

Bending Tubing and Moldings

COURTESY CERRO DE PASCO COPPER CORPORATION

WITHOUT proper external and internal support, buckling, flattening or wrinkling will occur when thin-wall tubing, moldings and extrusions are bent. External support is provided by tools that inclose the work at the bending point. Internal support is provided by use of a temporary filler material. Lead, tar, rosin and sand have been used. All of these have certain disadvantages. On the other hand, a low-melting-point alloy like Cerrobend, developed for the purpose, can be employed with certain techniques to give satisfactory bends.

This eutectic alloy of bismuth, tin and lead melts at 158 F., flows like water, penetrates small openings, thus detects pinholes or cracks. Slight expansion of the alloy takes place at solidification, providing good support during bending, rolling, swaging or drawing. The material melts out cleanly in boiling water. By its use, chromium or nickel-plated tubes can be bent without flaking.

Melting—A double-boiler type of melting tank, Fig. 1, (preferably of stainless steel to avoid contamination of the alloy) is used. A basket or perforated sheet or hooks should be supplied to support the work while melting alloy out of finished bends. Tubes or molds are filled with molten alloy by means of the valve. Aluminum, copper or galvanized containers should not be used. For the occasional job, employ an agate or porcelain-enameled double-boiler of the household type. For production use, obtain electrically heated equipment of adequate capacity.

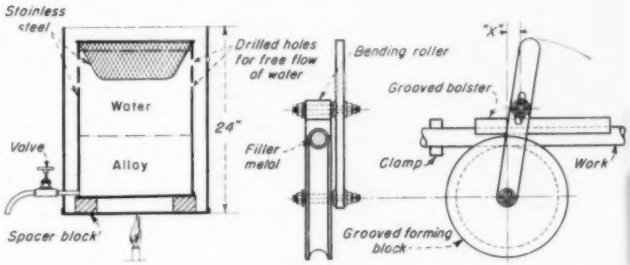


Fig. 1 Fig. 2

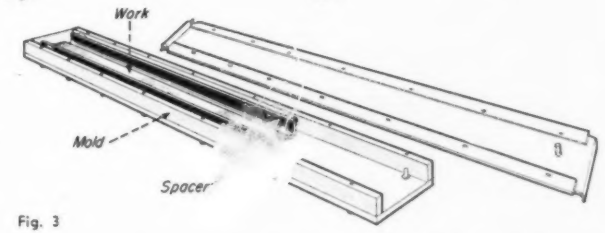


Fig. 3

Steps in Process

Tube Preparation—Remove internal dirt or scale with a mechanical pull-through, rag or brush, or by sandblasting. Do not use pickling, because retention of acid or salts will destroy a continuous oil film on tube interior and will allow "tinning" of the alloy to the tube wall. Plug one end of the tube, fill with high-grade straight mineral oil equivalent to SAE No. 10. Do not use motor oil with detergent additives. Allow oil to drain out, recork tube and stand it in 185-195 F. hot water up to two or three inches of the open end. Allow two or three minutes for preheating. Then pour the alloy slowly into the tube while it is still standing in hot water. Tubes of ¼ in. diameter or smaller should be preheated in boiling water.

Quenching—Successful bending of filled tubes depends on rapid chilling of molten alloy in order to obtain filler metal of high ductility. Chilling should start at the bottom of the filled tube and gradually progress to the top. A simple tank may consist of a 4- or 6-in. pipe of proper length, provided with a water inlet at bottom and an overflow takeoff at top. Or quench tanks can be made of wood, sheet metal or concrete. Never bend the filled tube until it assumes room temperature.

Bending—Fig. 2 shows a bending device suited to bending alloy-filled tubes. To obtain perfect bends it is important that radial distance between bending roller and central pivot be carefully adjusted to a suitable dimension *X* (usually two-thirds of tube diameter, but variable according to metal and wall thickness).

Unloading the Tube—The formed tube is immersed in nearly boiling water and maneuvered gently to allow the alloy to drain away. Avoid violent agitation or else the protective oil film will wash off. Plunge the unloaded tube in cold water for 2 min. to solidify any remaining drops of the alloy. Never use a torch to melt out the alloy.

Cleaning—Pass a tight-fitting wad through the tube twice from each end. If minute particles remain after this cleaning step, remove by scrubbing with a tight-fitting, oil-soaked rag or felt pad with tube in boiling water.

Moldings and Extrusions—These can be bent by supporting them on chaplets in a pan or trough to form a mold, Fig. 3, placing a cover on mold, oiling, filling with Cerrobend and quenching. Then the "casting" is removed from the mold, bent, and the alloy removed with hot water.

If a hard-drawn channel section is involved, it is cast into the alloy as stated, with a steel bar bolted to the underside of the section, and then bent after removal from the mold. This has the effect of shifting the neutral axis outside the piece, so that all fibers are in tension during bending, and no compression stresses are involved to cause buckling.

begins on a milling machine

How the free-machining types of ARMCO Stainless Steels can be milled to unusual shapes at high production rates is illustrated by the milling-record on this patented fishing lure.

ARMCO Stainless Type 303 bars are cut on a bias to produce the unusual elliptical shape. The tooling set-up includes a sliding stock rack which permits three bars to be cut at the desired angle. Cutters are 4 inches in diameter, with 32 teeth. Position of the bars is changed for each successive cut. A heavy weight on the arbor support arm dampens vibration.

The job is run at 74 feet per minute with a table feed of 1.25 inches per minute. Three sizes of lures are made—from 1" D, ¾" D and ½" D bar stock. Production rate, for example, is about 40 pieces per hour on the ½" D bar stock (two cuts for each piece). Sulfur-base oil is the lubricant.

This milling machine has an automatic cycle, featuring a rapid advance and automatic feed.

For fishermen it's *more flash, more fish!* The flat mirror-like surface of ARMCO Stainless Steel stays bright and shining—lures 'em in casting or trolling.

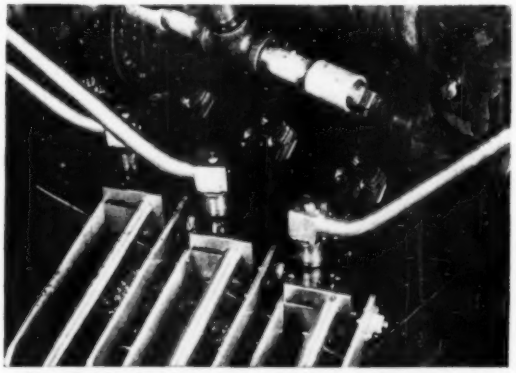
If this unusual milling job suggests the use of these rustless steels in your products, let's talk it over. You may be in for a pleasant surprise when you study cost data. Just write Armco Steel Corporation, 47 Curtis Street, Middletown, Ohio.

ARMCO

ARMCO

STAINLESS

STEELS



ARMCO Stainless Steel bars are cut on a bias to produce an unusual shape that is milled into a fishing lure at a high rate of production.

Simplified Practice Recommendations

SOURCE: COMMODITY STANDARDS DIV., U. S. DEPT. OF COMMERCE

Metal-Cutting Bandsaws: NO. R214-48

THE metal-cutting bandsaw designated "hard-edge, flexible back" is any saw with or without set, the tooth edge of which is hardened more than the portion below the gullets. When regular-type bandsaws are set, a *wavy* set is used for saws with 32 teeth per in.; a *wavy and raker set* for ½x0.025-10 and 14; ⅝x0.032-10 and 14; ¾x0.032-10, 12 and 14 and 1x0.035-10 teeth per in. A *raker set* is used for all other regular-type bandsaws. For the skip-tooth bandsaws, a *raker* or a *straight* set is used, according to the producer's standard.

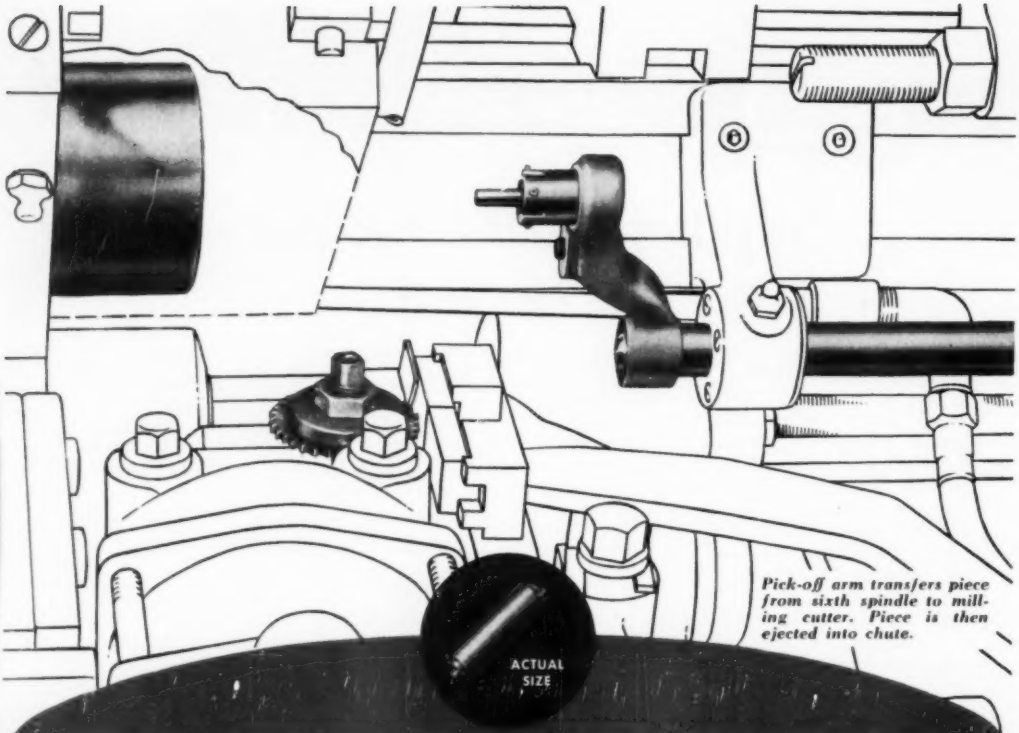
WIDTH, IN.	THICKNESS, IN.	NUMBER OF TEETH PER INCH
	Regular-Type Bandsaws	
⅛	0.025	24, 32
3/16	0.025	18, 32
¼	0.025	14, 18, 24
⅜	0.025	10, 14, 18, 24, 32
½	0.025	10, 12, 14, 18, 24, 32
⅝	0.025	8, 10, 14, 18, 24
¾	0.025	6, 10, 14, 18, 24
⅞	0.032	8, 10, 14, 18, 24
1	0.032	6, 8, 10, 12, 14, 18
	0.035	6, 8, 10, 14
	Skip-Tooth Bandsaws	
¼	0.025	4, 6
⅜	0.025	3, 4
½	0.025	3, 4
¾	0.032	3
1	0.035	2, 3

Low-Pressure Lubricating Devices: NO. R2 32-48

KIND	Size	Shank pipe thread	Capacity
OIL CUPS	*No.*	*In.*	*Oz.*
Cast brass, screw lid	00	⅛	1/10
	1	⅛	1/10
	2	¼	½
	3	¼	¾
	4	⅜	1¼
	5	⅜	1¾4
Cast brass, spring lid, straight shank	00	⅛	1/10
	0	⅛	1/8
	1	⅛	1/10
	2	¼	½
Cast brass, hinge lid, straight shank	0	⅛	1/8
	1	⅛	1/10
	2	¼	½
	3	¼	¾
	4	⅜	1¼
	6	⅜	2½
Cast brass, hinge lid, elbow shank	0	⅛	1/8
	1	⅛	1/10
	2	¼	½
Cast brass, screw lid, elbow shank	00	⅛	1/10
	0	⅛	1/8
	1	⅛	1/10
	2	¼	½
	3	¼	¾
	5	⅜	1¾4
Cast brass, screw lid, lever handle cock, straight shank	00	⅛	1/10
	1	⅛	1/10
	2	¼	½
	3	¼	¾
	4	⅜	1¼

KIND	Size	Shank pipe thread	Capacity
GREASE CUPS	*No.*	*In.*	*Oz.*
Cast brass, automatic feed	00	⅛	⅛
	1	¼	1½
	2	⅜	3
	4	½	10
Cast brass, automatic feed, removable body (for filling)	00	⅛	⅛
	1	¼	1½
	2	⅜	3
	4	½	10
Stamped brass, automatic feed, with cap	00	⅛	⅛
	0	¼	1
	1	¼	1½
	2	⅜	3
	3	½	6
Cast brass, plunger screw feed, marine	00	⅛	⅛
	1	¼	1½
	2	⅜	3
	4	½	10
Stamped brass or steel, plunger screw feed, marine	00	⅛	½
	0	¼	1
	1	¼	1½
	2	⅜	3
	3	½	6
Cast brass, plain base, cap screw feed	000	⅛	¼
	00	⅛	½
	0	¼	⅔
	1	¼	1
	2	⅜	2
	3	½	3½
	4	½	5
Stamped brass or steel, cap screw feed	000	⅛	¼
	00	⅛	½
	0	¼	⅔
	1	¼	1
	2	⅜	2
	3	½	3½
	4	½	5

KIND	Size	Shank pipe thread	Capacity
	No.	*In.*	*Oz.*
Pressed brass or steel, plain base, wing screw cap feed	000	⅛	¼
	00	⅛	½
	0	¼	⅔
	1	¼	1
	2	⅜	2
Cast brass, packed base, cap screw feed	000	⅛	⅛
	00	⅛	⅛
	0	¼	⅔
	1	¼	1
	2	⅜	2
	3	½	3½
	4	½	5
Pressed brass or steel, packed base, cap screw feed	000	⅛	¼
	00	⅛	½
	0	¼	⅔
	1	¼	1
	2	⅜	2
Pressed brass or steel, packed base, wing screw cap feed	000	⅛	¼
	00	⅛	½
	0	¼	⅔
	1	¼	1
	2	⅜	2
Cast brass, ratchet lock, cap screw feed	000	⅛	⅛
	00	⅛	⅛
	0	¼	⅔
	1	¼	1
	2	⅜	2
Pressed brass or steel, internal ratchet	000	⅛	¼
	00	⅛	½
	0	¼	⅔
	1	¼	1
	2	⅜	2
	3	½	3½
	4	½	5



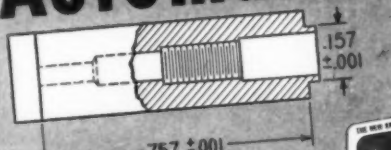
Pick-off arm transfers piece from sixth spindle to milling cutter. Piece is then ejected into chute.

ACTUAL SIZE

770 COMPLETE PIECES AN HOUR

Formed, drilled, tapped and milled on a Model 60

New Britain Automatic



Pick-off and transfer to milling attachment in sixth position makes it possible to drop off this complete piece in one operation, thereby holding down the cost of a highly competitive assembly. Because of the quantity involved, the close tolerances and the size of the piece, a second operation is out of the question.

Special machine performance on a general purpose machine with rigidity and accessibility means double protection of your machine tool investment.

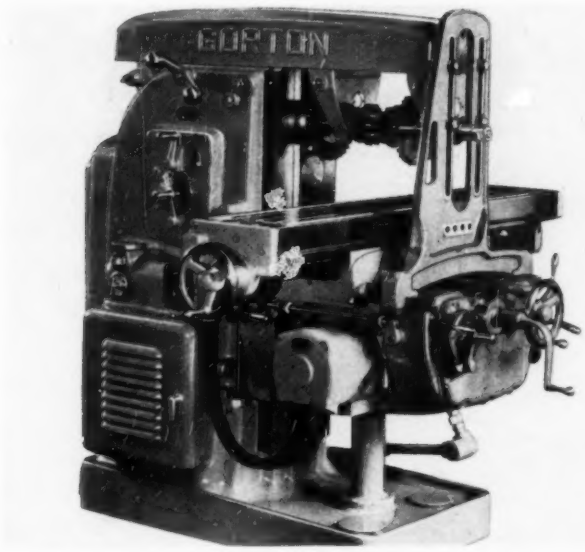
Would you like to see other types of work done on this and other New Britains? Send for *"It Can Be Done"* . . . a fact packed portfolio of actual cost histories and money-making production methods.

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

Shop Equipment News



No. 2 Production Milling Machine Is Plain Type with Fullwidth Knee

The plain-type No. 2 production milling machine, offered by George Gorton Machine Co., Racine, Wis., features the Fullwidth knee. Ten horsepower is delivered to the spindle through a simplified gear train. A separate motor is used for longitudinal, cross and vertical power feeds.

The Model 2-28B features a Fullwidth knee mounted on the column by a square lock bearing. A narrow center guide is provided on both column and knee to furnish a positive guard against tipping of the knee and cocking of the saddle. The speed-range selector handle and speed-selector crank offer 18 speeds. The feed selector crank and dial offer 16 feeds.

Working surface is 12x56 in. Capacities are: vertical feed, 18¾ in.; longitudinal feed, 28 in.; cross feed, 12 in. Range of speed varies from 50 to 2000 rpm. The rate of traverse longitudinal and cross is 150 ipm., while the vertical rate is 75 ipm.

Lubrication for spindle, gear train and speed box is provided by pump and reservoir in the column. Lubrication for gearing in the knee, elevating screw, as well as the column bearing surfaces, is accomplished by a separate pump and reservoir in the knee.

The spindle motor is inclosed in the column base, inserted through a small service door on the left-hand side and mounted parallel to the spindle. Three-way ventilation is provided for the motor, belt and pulley.

The diameter of the spindle nose is 5 1/16 in.; size of the hole through, 1⅛ in. The rated horsepower of the feed and rapid traverse is 2 hp., while the rated horsepower of the coolant pump is ¼ hp.

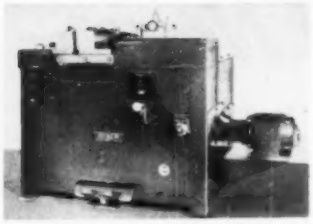
An adjustable coolant nozzle directs the coolant at any desired angle and can be readily turned off and moved out of the way. The inclosed coolant return channel takes coolant from the machine table to the reservoir in the base.

A self-contained control cabinet is mounted on the right-hand side of the column. All electrical controls are interlocked so that if the spindle motor stops for any reason, all machine elements stop.

Electric Laboratory Furnace Operates Normally at 2500 F.

The Pereny Equipment Co., 893 Chambers Road, Columbus 12, Ohio, offers the Pereco CB-55 electric laboratory and shop furnace. The work chamber is 12x8¾x6 in. Normal operation is at 2500 F. Up to 3000 F. is permissible for occasional flash firings. The furnace has an automatic electronically operated, indicating and controlling pyrometer. The model operates on 230 volts, 60 cycle, single phase ac., 11 kw. input at maximum, with variable control from 3.5 to 11 kw. Three-phase wiring can be furnished.

A lightweight 7½-in. super-refractory insulation is said to cut heat radiation loss to a minimum. Mesh guards at the back and sides can be removed for immediate access to heating elements and working parts.



Agnew Automatic Flash Welder Is Hydraulically Operated

A hydraulically operated flash welder which is automatic except for loading and unloading is made by Agnew Electric Co., Milford, Mich. Listed as Type HAB, the hydraulic welder features a hydraulic pump which supplies the pressure to actuate the movable platen, and a slow valve which controls the flash cycle. Air is used for clamping. Height to the platen is 36 in.; floor space is 3x4 ft.

Precision Lettering Instrument Gives 500 Variations from Templet

The Varigraph Co. Inc., 2715 Vine St., Lincoln 3, Nebr., offers a lettering instrument called the Varigraph which by dial adjustment can achieve more than 500 variations from one templet. Templets are available in sixteen popular alphabets.

The Varigraph is adjustable in scale to variations as fine as 0.005 in. By using two dials on the face of the Varigraph you can reduce, condense, or extend the reproduction of any templet alphabet in the ratio that is desired.

Black Industries Drilling Unit Offers a Single Rotating Member

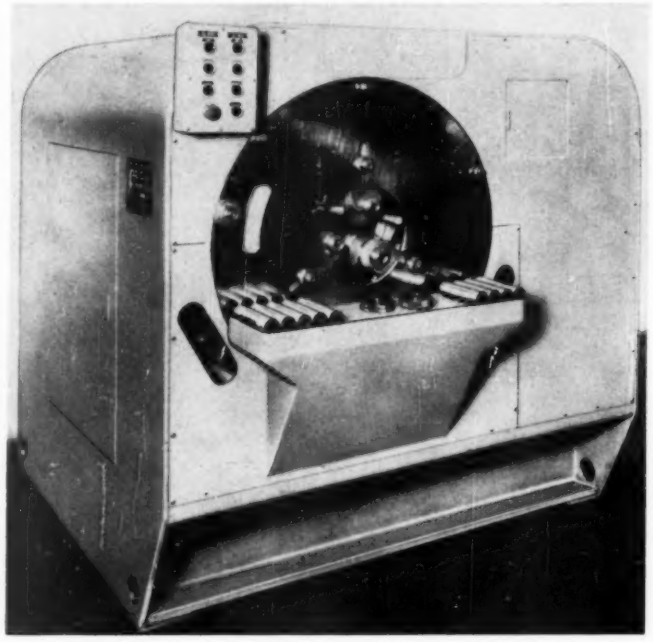
Black Industries, 1400 E. 222nd St., Cleveland, Ohio, offer a drilling unit featuring a single rotating member. The unit uses a traversing motor shaft for the work spindle. Because spindle and motor rotor are integral, torque is applied evenly around the spindle. This construction is said to allow little end play, to make for accurate drilling and also to materially increase the life of the drill.

Air feed gives rapid advance to the work with hydraulic control from this point until the work cycle is completed. The micrometer stop insures depth drilling accuracy to within 0.001 in.

Drilling units from ¼ to 1 hp. have the same base-to-center-of-spindle dimension. Units will operate in any position and can be used for drilling, tapping, centering, chamfering, counterboring, and other varied applications.

Arc Welding Electrode Permits Touchwelding in All Positions

The North American Philips Co. Inc., 100 E. 42nd St., New York 17, N. Y., offers the Norelco manual arc-welding electrode, having a special type of coating. Touchwelding is possible in all positions. Automatic starting and reigniting properties eliminate the necessity of striking and restriking the arc. The contact electrode can be used with ac. or dc. reversed or straight polarity.



Reed Cylindrical Die Thread Roller Handles Threads to 4-in.-Dia. Size

The Model A32 cylindrical die thread roller is announced by Reed Rolled Thread Die Co., 237 Chandler St., Worcester 2, Mass. The machine handles thread rolling to 4-in.-dia. threads. Model A32 is a horizontal type machine. It supports the work blank horizontally between three synchronously rotating cylindrical dies. The three dies act on the blank simultaneously and hold it rigidly in proper rolling position.

The rolling pressure causes the material to follow the pattern of the dies which always remain in match during rolling. The penetration of the dies is controlled by a mechanical feed using a positive cam action that is said to insure controlled rate of penetration, predetermined length of dwell, and positive duplication of size.

A wide range of die and cam speeds in conjunction with interchangeable cams offer any desired cycle of squeeze, dwell, and release that is required for different materials, work, and thread or form specifications. Thread capacity varies from ⅝- to 4-in. dia. Five standard die speeds range from 115 to 640 rpm. Seven standard work cycles range from 2 to 26 per min. Coolant tank has a 55-gal. capacity.

NOW CHROMIUM PLATED FOR LONGER SERVICE LIFE

Another BIG STRIDE in *Extra* SERVICE

Chromium Plated

STANDARD **DuBo*** **PLUG GAGES**

DuBo Plug Gages have already won an excellent reputation for long-enduring service. Exceptionally long wearability is inherent in their basic design. *Now chromium plated gaging surfaces, available at very little extra cost, add a tremendous plus to their service life.*

For long runs and the more abrasive materials specify *Chromium Plated* DuBo Gages.

Be Sure To Write For DuBo Bulletin

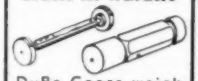
*Patents Pending

SINGLE END
Size 1.510" (38mm) and over

DOUBLE END
Under 1.510" (38mm)

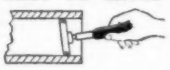
GAGING SURFACES are portions of a sphere

LIGHT IN WEIGHT



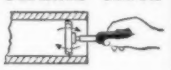
DuBo Gages weigh 70% to 80% less than cylindrical plug gages of equivalent size.

EASY TO ENTER



Simply tip handle slightly above bore axis. Enters even undersized bores easily.

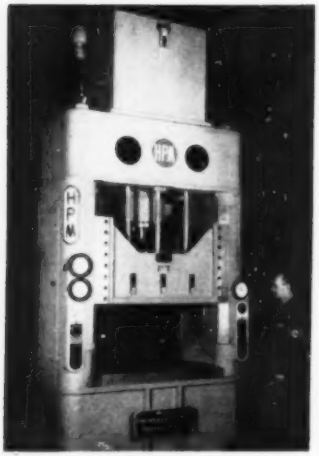
DEFINITE CHECK



Whether or not handle drops freely below center is definite yes-or-no answer.

STANDARD GAGE CO., Inc.

Poughkeepsie, N.Y.

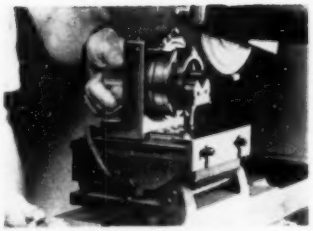


100-Ton Single-Action Press Offers a 48x36-in. Platen

A 100-ton HPM Fastraverse single-action press is an all-hydraulic, self-contained unit. Made by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, the machine offers a 48x36-in. platen, 30-in. daylight and an 18-in. main ram travel. Located in the press bed is a 33-ton hydraulic die cushion with a 32x25-in. platen and 7-in. stroke.

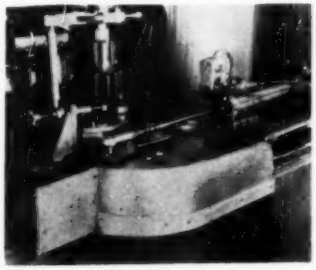
The press closes and opens at a rate of 770 ipm. It automatically reverses at a predetermined setting and slows down prior to die contact. Pressing speed under full load is 146 ipm. Operating on a 12-in. working stroke and building up 100-ton pressure on a solid surface, the press will cycle approximately 20 times per min.

CHECKING OF DIESEL PISTONS is accomplished by the Multicheck made by The Sheffield Corp., Dayton, Ohio. The machine simultaneously checks eleven critical dimensions and determines one of five skirt diameter classifications of diesel pistons. Interchanging the gaging points and locating cups permits any of thirteen different pistons within the 3 1/4- to 4¾-in. dia. group to be checked and also classified



Perforator Grinding Fixture For Regular, Irregular Shapes

The Harig Mfg. Co., 319 N. Albany Ave., Chicago 12, Ill., offers the perforator grinding fixture. All types of regular and irregular contours can be ground. Irregular shapes concentric with the shank can be ground within ±0.0002. Adjustable stops permit swing to any number of desired degrees. The index plate has 24, 15° graduations with ±0.0002 accuracy. The fixture can be used for concave and convex radius dressing and because of its radius-generating feature can be particularly applied to the grinding of carbide.

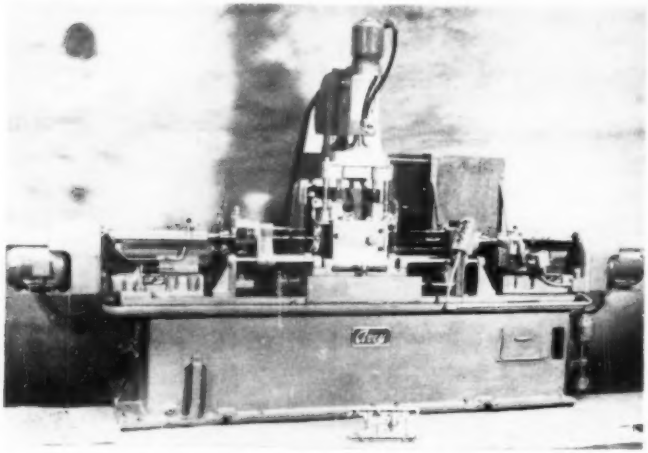


Automatic Gear-Hardening Machine Offers Induction Heating Methods

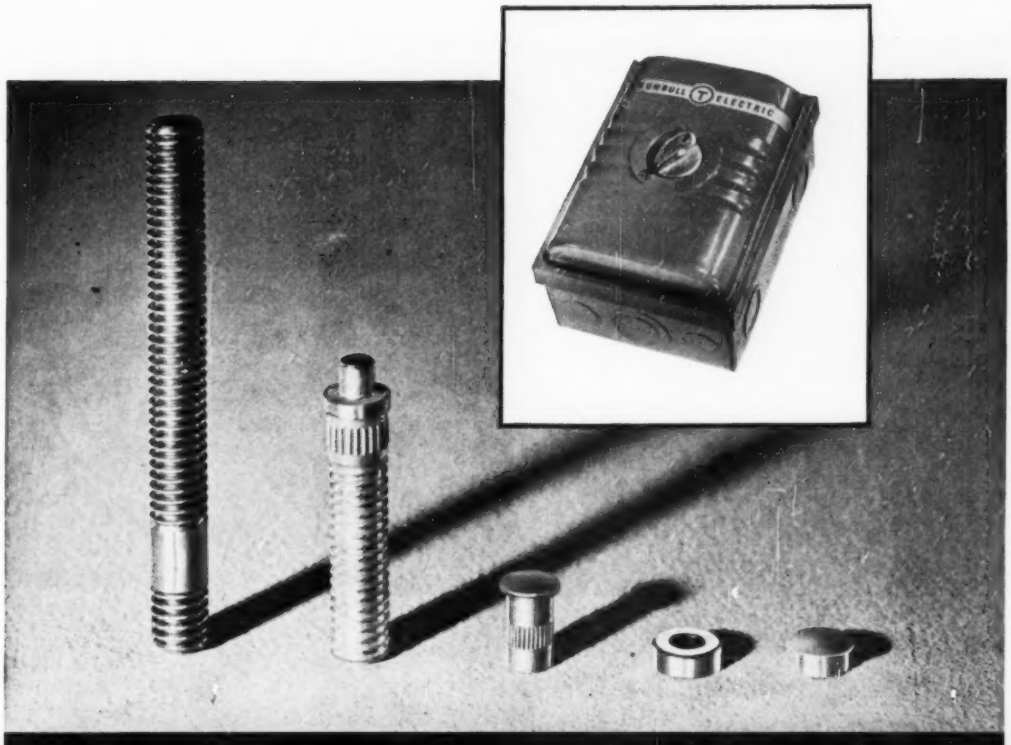
The Induction Heating Corp., 181 Wythe Ave., Brooklyn 11, N. Y., offers a gear-hardening machine. The automatic machine has a heating, quenching and indexing unit for hardening of gear teeth, one tooth at a time, by induction heating. Handling operations involve only the insertion and removal of gears.

Gears ranging from 20 in. in diameter with a 12-in. face or larger, depending on generator capacity, are accommodated by this unit. Individual teeth of a helical gear, carbon steel, 10½ P.D., 3-in. face with 46 teeth are heated and quenched in 7 sec. to Rockwell C hardness of 50 to 64.

Upon pressing the starting button after gear is inserted, each tooth of gear is automatically indexed, heated, and quenched until all teeth have been processed.



SPECIAL MULTIPLE-SPINDLE DRILLING MACHINE is built by the Avey Drilling Machine Co. Inc., Cincinnati 1, Ohio. The machine incorporates standard hydraulic and cam-feed drilling units with multiple-spindle U.S. drillheads attached for multiple-drilling operations. The machine was designed for producing top plates on sewing machines. Production is 75 complete top plates in a 1-hr. period



A CASE HISTORY SHOWING THAT

REVERE FREE-CUTTING COPPER SAVES MONEY

IF your product requires machined copper parts, it will pay you to investigate savings in machining costs made possible by Revere Free-Cutting Copper Rod. We would suggest that you make trial runs of this metal to prove what it will do under your own shop conditions. That was the procedure followed by The Trumbull Electric Mfg. Co., Plainville, Conn., with these results:

Part #18107 and 18108, contacts for the Type D switch illustrated, were designed around this alloy. Trumbull states: "On both these parts we found we could make them in one operation instead of two. That is, due to the smooth free cutting of the metal, it was unnecessary to perform a facing operation . . . Our screw machine foreman advises that, in his opinion, both these parts could be made four times as fast as out of ordinary electrolytic copper rod."

#3731, 60 amp. post stud.—5,760 pieces run in 19.6 hours with no machine down-time; 10,425 pieces of ordinary copper rod run in 66.6 hours with 11.8 hours machine down-time. In addition to the extra time required, three sets of dies were used for the regular rod. "The savings of the free-cutting material over ordinary copper were figured at $1.81 per thousand, including in these costs both material and direct labor."

#16552, space washer. "Savings per thousand over electrolytic copper were 77¢. This figure included the material difference and direct labor. In addition, there was an 18% saving in machine down-time."

#K-60-1A, 70-200 amp. stud. "The use of Free-Cutting Copper Rod on this part very definitely increased production and practically voided machine down-time."

In a letter to Revere, Trumbull added: "In general, at least for most of the parts we have used, we find that there is at least a 25% saving in machine time of free-cutting over regular copper. In addition, the workers are enthusiastic about this material, particularly when running studs, because of the fact that it is no longer necessary for them to keep a constant close watch on the machine to see that the turnings do not become tangled up with the moving parts of the machine."

The Trumbull experience is being duplicated in other machine shops. If you have not tried this Revere Metal, we suggest you get in touch with your nearest Revere Sales Office.

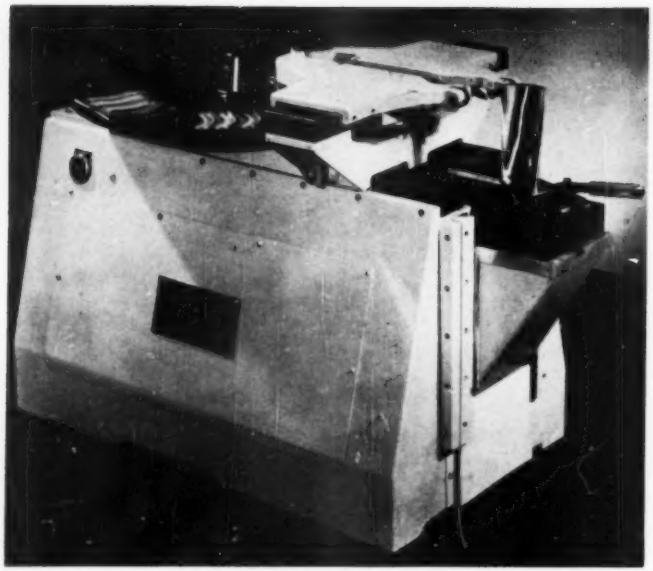
REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y. — Sales Offices in Principal Cities, Distributors Everywhere.



Pant-O-Scriber Blade Checker Automatically Checks Blades

Engineers Specialties Div., The Universal Engraving & Colorplate Co., Inc., 980 Ellicott St., Buffalo 8, N.Y., offers the Pant-O-Scriber Blade Checker, a fast method of inspecting airfoil contours of blades.

The automatic machine was built working with one of the jet motor plants. Its operation was clocked at 43 sec. for a three-section blade. Blades were completely checked for contour, twist, thickness, width, etc., in less than one minute.

A permanent inspection record of each blade is obtained at the same time as it is inspected. The checker will automatically trace the blade at the sections to be checked and a coordinated rotating scriber automatically produces an exact scribing on a specially-coated glass plate of each section as traced.

The sections are scribed on the glass plate in relationship to the edge of the glass and to each other. The coating is a pleasing soft green color. A precision master inspection chart, actual size of the blade, is used together with the scribed plate for inspection purposes.

For production inspection purposes a go and no-go Bridge Tolerance Chart is used. Three standard models are available.

Bonded Disk Wheel by Manhattan For Portable Grinding Tools

Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J., offers the Moldisc, a bonded disk wheel for rotary sanders. Disks are said to have the free-cutting qualities necessary in fabricating stainless steel and other alloys which must be ground and finished without generating excessive heat.

Moldiscs can be specified for roughing and fast metal removal as well as for finishing operations. They are supplied in a standard 7-in. diameter, ¼-in. thickness and ⅞-in. holes. Speeds up to 6000 rpm. for the 7-in. disks are recommended for best operating efficiency.

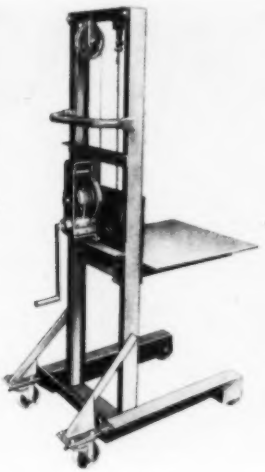
Kraus Hoppers Offered for Automatic Feeding of Parts

Kraus Design Inc., 41 S. Water St., Rochester 4, N. Y., offers hoppers for the automatic feeding of a variety of parts. Headless set screws can be hopperized with the driving end orientated upon delivery. Hoppers are individually engineered.

All-Aluminum Conveyor by Haiss Takes 500-lb. Loads, 30 Per Min.

The George Haiss Mfg. Co. Inc., Div., Pettibone Mulliken Corp., 140 First St., Park Ave., New York 51, N. Y., offers an all-aluminum conveyor for package handling. This is the Model 485-A which handles bags, bundles, boxes, crates, cartons, etc., weighing up to 500 lb. at the rate of 30 per min. Its lightweight feature enables it to be lifted by two men or carried by three men.

Any number of these conveyors can be combined into radially coupled units which carry packages in a straight line, around corners, over piles or obstructions, or onto elevating conveyors.



Barrett-Cravens Portable Elevator Lifts Loads of 500 lb. to 5 ft.

A one-man operated portable elevator, offers a capacity of 500 lb. which can be lifted from 1 to 5 ft. Made by Barrett-Cravens Co., 4609 So. Western Blvd., Chicago 9, Ill., the elevator can be used for placing dies in presses or die racks, loading and unloading motor trucks, piling cases, barrels or bales, elevating materials into storage, and other uses.

The crank is turned in one direction for raising the platform and reversed for lowering, with micro adjustment. The over-all height is 6 ft. Elevator has a platform 24-in. square. The base of the load handled is limited to 30x42 in.

Other features include: all-welded construction, cut spur-gear reduction, oilite bushing and floor brake.

780 PARTS PER HOUR

PART
Actual Size

Broaching STAMPINGS

INCREASES PRODUCTION AND IMPROVES FINISH

TOOLING:

The illustration at the top shows the tooling which Detroit Broach designed and built to broach the slot in this stamping. The operator loads the stamping at the front of the fixture. As the part is indexed around to broaching position, it is automatically clamped. Because the part is open and thin, the broach is returned through the part to starting position after broaching. The fixture then indexes again and the part is automatically ejected.

MACHINE:
Push Type Hydraulic Press

STOCK REMOVED:
1/32" Per Side

MATERIAL:
C.R.S. Stamping

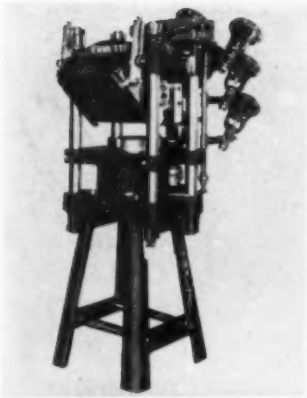
ALTERNATE METHOD:
Hobbing

With one broach and a completely automatic six-station indexing fixture, designed and built by Detroit Broach, these stampings are finished at a rate of 780 per hour. This production output is many times greater than is possible by other methods, and the finish of the broached surface is suitable for final assembly.

This performance record is typical of the production economies of Detroit Broach tooling. Because our engineers specialize in broach tooling only, they are familiar with all types and makes of machines suitable for broaching—as in this case where, to reduce tooling costs, a hydraulic press was selected. Through this knowledge they are able to recommend from all aspects the type of equipment best suited for any broaching operation.

Detroit Broach application engineers are at your disposal to discuss broaching problems. They will gladly supply you with actual cost and production data for your jobs. Write today for our representative to call.

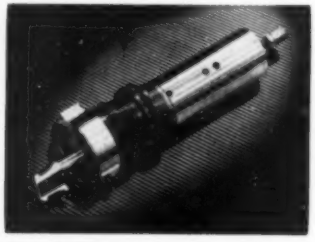
DETROIT *Broach* COMPANY
20201 SHERWOOD AVENUE
DETROIT 12, MICHIGAN



Tilting-Head Hydraulic Press Is Available in Two Sizes

The No. E-113 tilting-head hydraulically operated press is offered by Emmett Machine and Manufacturing, Inc., 2249 – 14th St. S.W., Akron 14, Ohio. Called the Merit Line of presses, they are available in two sizes having platens of either 14x14 in. or 24x24 in. Operating speed of the Model E-113 press is 3 sec. including opening and closing of mold and tilting of head.

The small press is stressed for a maximum pressure of 3000 psi. and the large press for a pressure of 2500 psi. Normal stroke is 2½ or 6 in. in the 14x14-in. size, and 8 in. in the 24x24-in. size.



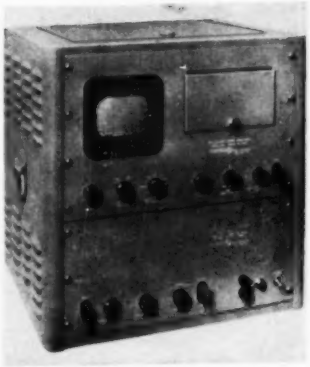
Recessing Tools by Maxwell For Multi-Spindle Automatics

The Maxwell Co., 386 Broadway, Bedford, Ohio, offers a line of Recess-O-Matic recessing tools designed for use on multi-spindle automatics. The new tools for actuation utilize a telescoping draw bar which connects to the back of the machine.

Work set-up requires no cam change. Actuating mechanism of the tool reduces machine feed in a ratio of 2.75 to 1 to recess cutter. Models 1½ DB, 2-DB and 3-DB have maximum capacities of 2, 3, and 4 in. respectively. Recessing stroke ranges from 9/32 in. on the smallest tool to ½-in. on the largest in the line. Model numbers indicate the outside diameter, and the tools will fit machine slide-tool holders of the same size.

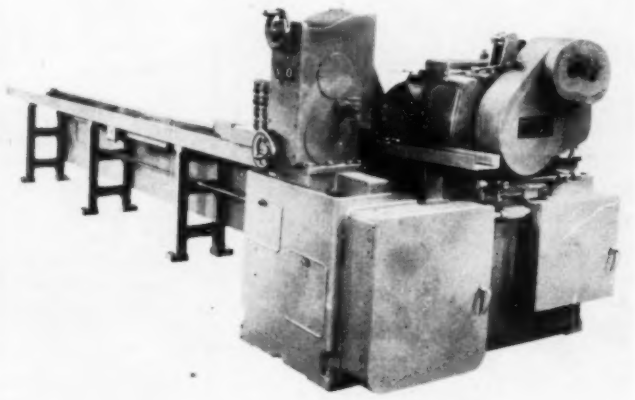
Hydraulic Elevating Table Offers a 4000-lb. Capacity

A hydraulic elevating table, made by Lyon-Raymond Corp., 6698 Madison St., Greene, N. Y., offers a 4000-lb. capacity. The table has a 30x30-in. top which revolves fully or can be locked in a fixed position. The top has a 14-in. range of elevation, and the lowered height is 28 in. The elevated height is 42 in. The table is especially suited for die handling.



Sonic Analyzer by Panoramic For Audio Frequency Analysis

The Panoramic sonic analyzer Model AP-1 is offered by Panoramic Radio Corporation, 92 Gold St., New York 7, N.Y. The instrument automatically separates the frequency components constituting a complex audio wave and simultaneously measures their frequency and amplitude. The instrument can be used for analyzing harmonic intermodulation, high-frequency vibration, noise and other sonic phenomena. It gives a panoramic graphic representation of frequency versus voltage. Continuous scanning is offered from 40-20,000 cps. in one second, by electronic means.

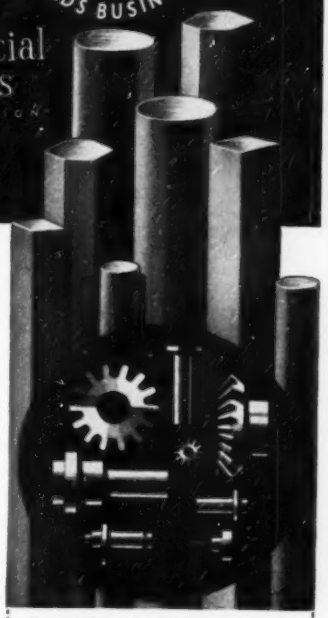


CIRCULAR-SAWING MACHINE is manufactured by Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, Ohio. The No. O-H circular-sawing machine handles stocks to 4 in., round or square. A single hydraulic pump supplies pressure for automatic stock feed, stock clamping, and headstock feed, and all operations are sequenced hydraulically for safety of tooling. The saw head has four saw-blade speeds with a choice of speed ranges for either ferrous or non-ferrous metals

"BRAINS" of the leading Business Machines are made from J & L cold-finished JALCASE STEEL...

J&L STEEL

Monroe
Smith-Corona
National
CASH REGISTERS · ADDING MACHINES
ACCOUNTING MACHINES
IBM
Addressograph
FRIDEN
ALLEN WALES
SPEEDS THE UNDERWOOD WORLD'S BUSINESS
MARCHANT
R.C. Allen BUSINESS MACHINES
Multigraph
Commercial Controls CORPORATION
Remington Rand



...the original, free-machining, cold-finished open-hearth steel... for better quality precision parts at lower cost.

Look inside a business machine of any leading make, and most likely you'll be looking at a mass of precision parts accurately machined from J&L cold-finished *Jalcase* Steel. To the uninitiated, the "brains" of these modern marvels appear like an insolvable maze, but every tiny gear, lever and cam has a definite job to do—a definite function to perform for rigid accuracy.

There are some sound business reasons why so many of these working parts are made from J&L *Jalcase*—the *original*, free-cutting, open-hearth steel:

- **Jalcase is the leading free-cutting steel—and has been for more than 25 years.**
- **It machines smoothly and easily at high speeds.**
- **It lengthens tool life and reduces the number of stops for re-tooling.**
- **It is easily and quickly heat treated.**
- **It has high wear resistance.**
- **Ten grades plus a number of special treatments offer the Jalcase user a wide range of desirable properties.**

If you machine steel in the manufacture of your products—investigate *Jalcase!*

We have just published a new brochure on cold-finished *Jalcase*, and shall be glad to send a copy to anyone interested in machining rod and bar stock. The coupon at the right is for your convenience.

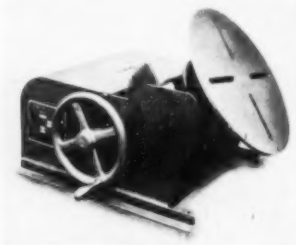
JONES & LAUGHLIN STEEL CORPORATION

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 30, Pennsylvania

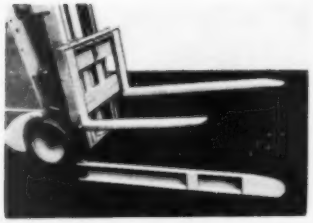
Please send me your new brochure describing J&L cold-finished *Jalcase*—the original free-cutting, open-hearth steel.

NAME_____
ADDRESS_____
CITY_____ ZONE_____
STATE_____

AIR IMPACT HAMMER offered by Blank Machine Tool Co., 3101 E. Michigan Ave., Jackson, Mich., is for use in metalworking, plastics and textile shops. Listed as the Bryant Model Z-6, the hammer is good for light stamping, small forgings, straightening steel castings, trimming, molding, crimping, coining, riveting, and has other uses. In the Bryant air impact hammer the stroke is constant. Impact pressure can be varied precisely from 2800 lb. to 40,000 lb., or up to maximum capacity. A common 100-lb. pressure line is all that is necessary. Air consumption required is 1 cu. ft. for every 15 strokes



WORK POSITIONER is offered by Ransome Machinery Co., subsidiary of Worthington Pump and Machinery Co., Dunellen, N. J. It is motor-operated and driven by a hydraulic variable-speed transmission and a ½-hp. single-phase ac. motor. Known as Model I-P, it has a load capacity of 100 lb. Table top rotates 360° at variable speeds adjustable from 0 to 5 rpm. in either direction. It is manually tilted to 135° and locks at any degree of tilt by means of a worm-and-segment

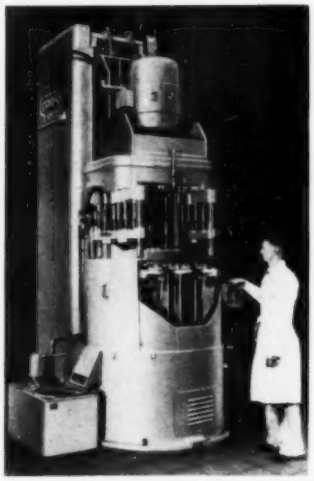


SLIP-ON FORK EXTENSIONS are now offered by Lewis-Shepard Products, Inc., 271 Walnut St., Watertown 72, Mass. The slip-on fork extensions make it possible to handle loads of different lengths efficiently with the same fork truck. The welded-steel fork extensions are available with various styles of ends: tapered ends for handling rolls of paper; standard ends for picking up pallets; chisel ends for handling bagged or other loose material; and many others

Filing Cabinet for Drawings Accommodates to 1000 Prints

The Draw-In-Dex cabinet, offered by Empire Development Corp., 209 Union Trust Bldg., Washington, D. C., accommodates to 1000 prints, any of which can be immediately removed or replaced without disturbing the others. It measures 20x30 in., and is 4 ft. high. Suspension rods on hinges hold the drawings.

When the cabinet's front panel is opened, the rods slide apart in such a manner that the prints can be removed or inserted in their indexed positions. Built-in index cards and lock are standard equipment. Colors available are gray, green and brown.



SPECIAL MACHINE drills, countersinks, and reams five holes in the flanges of automobile rear-axle shafts at the rate of 255 pieces per hr. Offered by Cross Co., Detroit 7, Mich., the 4-station machine handles two pieces at each station. Independent floating work-holding fixtures insure concentricity between the holes and pilot diameter. At station 1, the flange is drilled. At station 2, it is countersunk, and at station 3, reamed. Flexibility for part design changes is provided through the use of a standard Cross column and index. Steel ways are hardened and ground. Feed and rapid traverse are hydraulically operated. Control of the automatic cycle is by pushbutton.

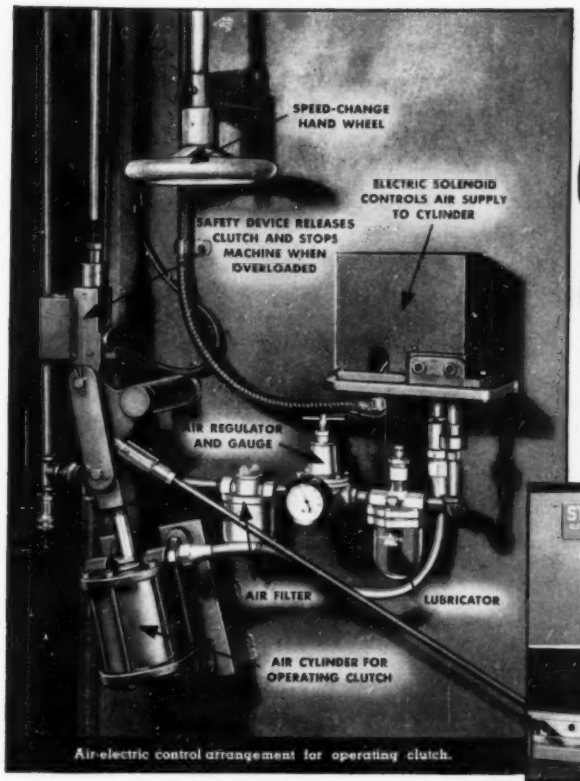
Fast-Spiral Carbide Drills Offered by Super Tool Co.

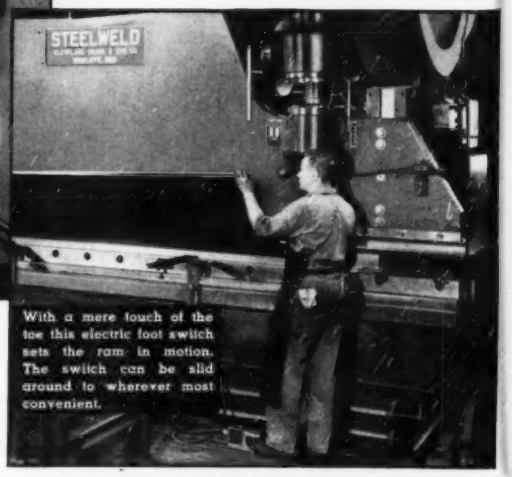
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich., offers a fast-spiral carbide-drill line. The line is offered in sizes of 3/16 to ½ in. Drills are available in corresponding letter and wire sizes, have straight shanks and are designed for deep-hole drilling in aluminum, magnesium, and soft plastics.

Stop Unit Offers Micrometer Control of the Cutting Depth

The Aero Tool Co., 6930 Avalon Blvd., Los Angeles 3, Calif., offers the Aero micrometer stop unit which operates on the micrometer principal using a 40-pitch ground thread. It can be adjusted in increments of 0.001 in. without removing stop from the machine.

Air-Electric Control for STEELWELD PRESSES


SPEED-CHANGE HAND WHEEL
ELECTRIC SOLENOID CONTROLS AIR SUPPLY TO CYLINDER
SAFETY DEVICE RELEASES CLUTCH AND STOPS MACHINE WHEN OVERLOADED
AIR REGULATOR AND GAUGE
AIR FILTER
LUBRICATOR
AIR CYLINDER FOR OPERATING CLUTCH
Air-electric control arrangement for operating clutch.



With a mere touch of the toe this electric foot switch sets the ram in motion. The switch can be slid around to wherever most convenient.

Various types of air-electric control can be furnished for Steelweld Bending Presses.

With this control an air cylinder does the work of throwing in the clutch which ordinarily is done by a mechanical foot-operated treadle. The air cylinder can be actuated by hand button, foot switch or various combinations of both.

Air-electric control eases the operator's work and speeds production of large orders of duplicate parts. It is especially advantageous in cutting costs when several hundred or more parts are produced at a time.

A selector is usually incorporated in an air-electric control circuit to provide various ram movements such as long stroke, short stroke, continuous operation and inching. For instance, it may be set to stop the ram on the down stroke just before the upper die reaches the lower one, or it may stop the ram at the top of each stroke.

Steelweld engineers are constantly on the alert for ideas and developing improvements that will aid the users of Steelweld Presses to get the most out of their machines.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

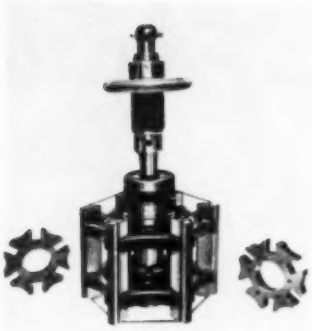
THE CLEVELAND CRANE & ENGINEERING CO.

1419 EAST 283RD STREET • WICKLIFFE, OHIO

STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING



BALL HONING TOOLS are offered by C. Allen Fulmer Co., Cincinnati, Ohio. Distributed throughout the United States as the Alexander Ball Line of British-built honing tools, these tools permit use in small-sized shop to utilize honing as a production stock-removing process. The tools have been designed to produce round, straight bores to the closest tolerances, and to insure fast stock removal by honing. Tools are available in sizes from ½ to 50 in. in diameter in types to finish open bores, ported cylinders or blind holes, all of which are equipped with diametrical sizing stops. They are also available in a range of sizes for automatic expansion up to a sizing stop that can be set for definite stock removal. Tools are built of chrome nickel steel

BARREL PLATING equipment is offered by Hanson-Van Winkle-Munning Co., Matawan, N. J. The improved line included vulcanized rubber for rubber-lined tanks. On all rinse tanks two overflow outlets are now provided and in each corner the dam overflow is depressed 2 in., so that the solution level is now about 6½ in. instead of 3½ in. Monel cylinders, illustrated, will now be furnished with monel shaft, hanger arms and gears, as this alloy has been found to be more satisfactory for parts in contact with acid solution than phosphor bronze which was formerly used. Green rubber parts are again available and all rubber cylinders are being furnished with this material

Discharge Height of Over 12 Ft. Possible with Oakite Steam Gun

A solution-lifting steam gun, Model 481, is offered by Oakite Products, Inc., New York 6, N. Y. The gun, with an over-all length of 5 ft., is so balanced that it can be used over extended periods without tiring the operator. Two spade-type insulated handles are provided and are so positioned that each of the operator's hands supports the same weight during a high pressure steam-cleaning operation. The steam gun develops sufficient vacuum to discharge cleaning solutions to a height of over 12 ft., permitting thorough cleaning of large-equipment surfaces.

The forward handle of the gun remains stationary in the operator's grasp as the gun is rotated, while the rear handle is turned to rotate the gun when cleaning underneath and hard-to-reach surfaces.

Steam and solution hoses are connected to the gun by swivel joints and remain stationary when the gun is rotated, thus eliminating twisting of hose lines during cleaning operations. The whole gun-nozzle, tubes, valves and hoses turn freely as a unit at the back handle is moved.

Bel-Ray Oven Chain Lubricators Automatically Apply Lubricants

The Bel-Ray Co., Inc., Green Village Rd., Madison, N. J., offers a new series of oven chain lubricators. The lubricators are used for automatically applying lubricants (graphited) to conveyor chains on ovens, furnaces, dryers, and other equipment. This system eliminates the hand methods of applications.

The system consists of three component units: a series of oven chain lubricants, the lubricator which is a drop-feed type fitted with hand or motor-operated agitator, and the lead-in device for delivering the lubricant to the exact location desired.

Electrode Steam Generators Come in Three Pressure Ranges

The Series No. 512 1½-hp. boilers, the latest addition to the Speedy-lectric line of Electrode Steam Generators, is offered by Livingstone Engineering Co., 100 Grove St., Worcester 5, Mass.

These boilers are available in three pressure ranges: Series No. 512-100 psig., No. 612—200 psig., and No. 712—250 psig. Operating on 220 volt, single-phase power, the units measure 14x21x35 in. The units generate 45 lb. per hr. to serve a two-platen heavy-duty compression molding press, with a platen 20x30x2 in., on a straight heat cycle.

In addition to plastics molding, industrial applications include heating of rubber rolls, glue pots and laboratory presses and other places where Speedylectric balanced control gives precise regulation of critical processing temperatures.

Series 1700 Electric Furnaces Offer Special Door Arrangement

Thermo Electric Mfg. Co., 461 West Locust St., Dubuque, Iowa, offers the Series 1700 Temco electric furnaces, employing a special door arrangement. To permit access to the heating chamber with minimum loss of heat the heavily insulated door has been divided into an upper and lower section. Both sections are controlled by a single counter-balanced lever.

By moving the lever from the forward position to vertical, the lower section is lowered separately while the upper section remains snugly in place over the top half of the heating chamber. A further 60° movement of the lever will raise the top section and expose the full chamber.

The Series is built with a chamber opening of 8½x7½ in. and in depths of either 13½ or 18 in. Operation is on 230 v., 50 or 60 cycles, single phase.

Black & Decker Porto-Shear Will Cut 12-gage Sheet Steel

The Black & Decker Mfg. Co., Towson 4, Md., offers the 12-gage Porto-Shear. This tool expands the range of shearing capacity in a variety of materials. It will cut 12-gage standard sheet steel while cutting approximately two gages thinner in Monel metal and stainless steel and approximately 50% above the rating in sheet copper, aluminum, lead and other non-ferrous metals.

The portable shear will follow an irregular pattern because the cutting blade is always visible, and will cut on a radius as small as 1½ in.

25,000th Monarch Lathe with exclusive Flame-Hardened Ways; a 14" x 54" Series 60 Engine Lathe purchased by B. F. Goodrich Co.—one of many repeat orders from this customer. Customer's Engineering Division was represented by its Master Mechanic in charge of Machine Tool Operations, as the lathe was made ready for shipment.

Unretouched photograph of bed of Monarch 12" Engine Lathe after eight years' severe service. Inspector's report shows no measurable wear of ways.

Salute! from a Veteran to Its 25,000th Brother

"SO you're the 25,000th Monarch Lathe with the famous Flame-Hardened Ways! You look so sleek and sure—*and accurate*—I don't blame your purchaser for being proud of you. Monarch's just as proud of me.

"Let me tell you why. I'm eight years older than you—and I've seen a lot more service than any *ordinary* lathe ever lives to see. I went to work back in September, '40. Right after that the war began, and I started working 24 hours a day, seven days a week. Hard work, too—I was turning out short pieces—plenty of short motions of my carriage, the kind that wear you down. And even though I told my operator it was bad, he often cleaned me off with an air-hose! But all that didn't stop me—I kept right on turning out war parts 'round the clock—each one with as fine a finish, as close a tolerance as the first I ever turned.

"Well, the war finally ended—but I kept right on working—though they did let up on my hours. I work a regular eight-hour day now, right along with the other master craftsmen. Recently my owners decided to hedge on rising production costs by sending me back to Monarch to be fitted out with the latest in time-saving, money-saving attachments. That's how I happen to be here for your christening party.

"But let me tell you what they've just found out about me. When they came to tear me down for inspection, they couldn't even find *any* measurable wear on my ways! Now do you blame 'em for being proud of you—and me?"

* * * *

The famous Monarch Flame-Hardening Process is an exclusive construction feature of every Monarch Lathe—one of many "pluses" to give you *peak production at a profit.* Write for complete details.

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

MONARCH MACHINE TOOL CO. • • • Sidney, Ohio

Parts and Materials

du Pont Introduces Vitreous Enamels for Use on Aluminum

E. I. du Pont de Nemours & Co. Inc., Wilmington, 98, Del., introduces vitreous enamel for aluminum. In comparison with vitreous coatings for steel, the materials are said to have the advantage of superior impact and flux resistance, and resistance to thermal shock. The exposure of bare metal does not give unsightly rust streaks.

Enameled aluminum can be cut with a hacksaw and can to a limited degree, be bent in the field. The cover coat enamels in general are resistant to the action of mild acids and can be formulated to give a very wide range of colors.

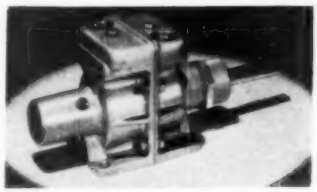
Strict adherence to the new preheating procedure and to the spalling quality-control test are considered essential to satisfactory results. Enameling of wrought 61-S alloy and non-porous castings of 43 alloy is recommended. In general, any surface of articles made of 43 to 61-S alloy which can be reached with a spray gun can be enameled.

Proper metal cleaning followed by a pre-treatment gives a good bond resistant to the action of water, between metal and ground coat because of the formation of a very thin film of closely adherent chemical products in the metal surface. A clean, active surface, free of grease, oil, and oxide is necessary to make the pre-treatment fully effective. The pre-treating bath is not a cleaner.

Nox-Rust Wrapper Eliminates Coating Iron, Steel Products

The Nox-Rust Chemical Corp., 2419 South Halsted Street, Chicago 8, Ill., offers a rust preventive wrapper which eliminates coatings of iron and steel products. The Nox-Rust vapor wrapper offers slow vaporization of a synthetic chemical contained in the wrapper which completely surrounds the part with a vapor sheath.

The slow vaporization of the chemical incorporated covers every surface of the ferrous metal and prevents all corrosive action of both moisture and air. The wrapper need not be sealed or even tightly wrapped to give this protection. The Nox-Rust wrapper itself is essentially a neutral paper, and the vapor arising from it is odorless, non-toxic, and is not injurious to the skin.



Gearless Pump Offered by Eco For Industrial Liquid Handling

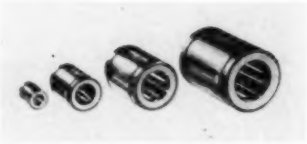
A gearless pump for the industrial handling of liquids is offered by Eco Engineering Co., 12 New York Ave., Newark 1, N. J. A dual eccentric piston design gives a strong flow against pressure. The pump body is of sturdy naval bronze forging or stainless-steel precision castings.

The pump is available in four sizes, ¼ in., ⅜ in., ½ in., and ¾ in. Capacities range from 1 to 12 gpm. varying with the pump speed. Pumps are available for use against pressures ranging from 0 to 100 psi. They can be run, and will deliver, at speeds from 200 to 2400 rpm.

Airmatic Quick-Exhaust Valve Takes Pressures to 200 Psi.

A quick-exhaust valve, Model QE 500, is made by Airmatic Valve Inc., 1643 E. 40th St., Cleveland, Ohio. Fluid pressure automatically opens the exhaust port to atmosphere when the main control valve is returned to normal position in a line close to the cylinder.

The valving action is operated by fluid through two poppet elements, eliminating fluid return through long piping to the main operating control valve. The valves are available for air, oil, and water at pressures to 200 psi. The design is offered in five standard pipe sizes, ¼, ⅜, ½, ¾, and 1 in. It is non-corrosive and has only two moving parts.



LINEAR BALL BEARINGS are offered by Thomson Industries, Inc., Manhasset, N. Y. The low-cost ball bearing is offered for linear motion, and is called the Series B Commercial-Grade Ball Bushing. The Series B Ball Bushings are built to the same basic dimensions and have the same free-rolling characteristics as the Precision A Ball Bushings. The tolerances on the Series B are not as close as on the Series A, and the load capacity is somewhat less. Series B Ball Bushings for four shaft diameters are now in production. These are 1/4 in., ½ in., ¾ in. and 1 in.

Emulsion Cleaner by DuBois Resists Hard Water Attack

The DuBois Co., Cincinnati 3, Ohio, offers MUL, a ready-to-use emulsion cleaner which combines solvent and emulsion cleaning with the synergetic action of soil penetrating agents. These prepare waxy and greasy buffing and grinding compound ingredients for removal by the emulsion.

MUL resists hard water attack and is said to minimize curd formation. It is inhibited against foaming even in the highest pressure washers. For interim rust inhibiting MUL is recommended for use in one-stage washers, as an additive to rinse tank, and as a dip.

Free-Machining Alloy Steel Is Introduced by Ryerson

A free-machining alloy steel is now available from Joseph T. Ryerson & Son, Box 8000-A, Chicago 80, Ill. Called Rycut, the steel is said to develop hardness comparable with that of AISI 4150-SAE 4150. Rycut is furnished in round, square and flat bar stock in the hot rolled and annealed condition, or heat-treated ready to use.

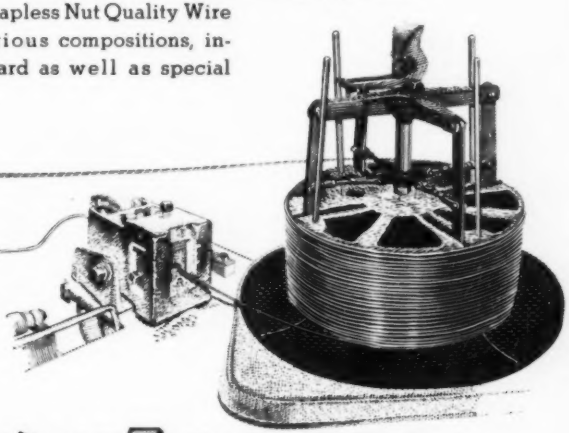
Scrapless Nut Wire

custom built to meet customers' requirements

SCRAPLESS Nut Quality Wire is not an ordinary steel for common applications. It is a custom built product designed to meet customers' specific requirements for cold heading, cold punching, cold expanding and threading, in the production of a variety of nut shapes on continuous heading machines.

Every step of its manufacture is carefully controlled--from the melting furnaces to the final drawing operation on the wire machines. Each coil of wire is subjected to close inspection and rigid tests with modern electrical testing apparatus.

Youngstown's Scrapless Nut Quality Wire is furnished in various compositions, including AISI standard as well as special sulphurized steels.



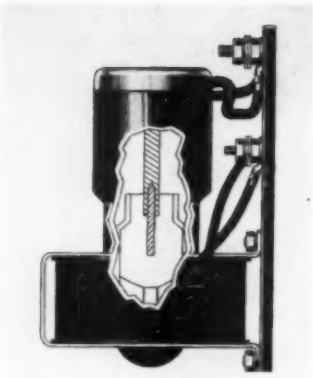
QUALITY YOUNGSTOWN SERVICE

Youngstown STEEL WIRE

THE YOUNGSTOWN SHEET AND TUBE COMPANY General Offices — Youngstown 1, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel Export Office - 500 Fifth Avenue, New York

WIRE - COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES.



Mercury-Type Relays by Durakool Operate on Double-Flow Principle

A line of improved hydrogen arc-quenched mercury-type relays are offered by Durakool, Inc., Elkhart, Ind. Relays operate on the double-flow principle. Contacts are between two pools of mercury, in the presence of hydrogen gas under high pressure, keeping arcing at a minimum.

Relays include four types of action, available with normally open or normally closed contacts. They are: quick operate-quick release; quick operate-slow release; slow operate-slow release; and slow operate-quick release. Time delays are available to specifications from 0.15 sec. to 20 sec.

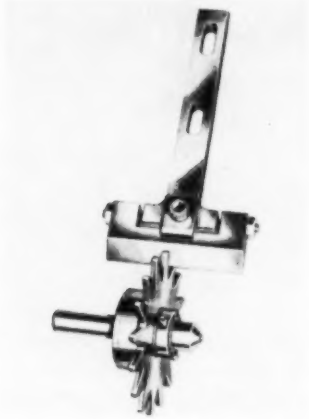
Mass Chemical Brightening For Aluminum, Its Alloys

Mass chemical brightening is offered by Technical Processes Div., Colonial Alloys Co., Philadelphia 29, Pa. The process is restricted to aluminum and its alloys, in their wrought forms.

Small parts such as stampings, pressing, drawings, and other products generally lend themselves to this method of chemical brightening. The chemical brightening is accomplished by dipping the cleaned work, in baskets, into the hot chemical-polishing solution for from 5 to 60 sec., then followed by thorough rinsing and drying.

Miniature-Type Ball Bearing Is of Full-Race Radial Design

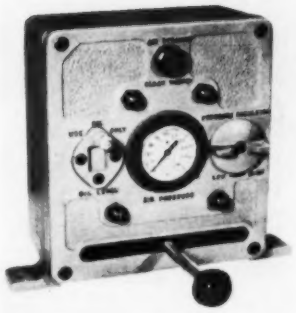
A miniature ball bearing is offered by Miniature Precision Bearings, Inc., Keene, N. H. The bearing is of the full-race radial type with 15—1mm. balls. All surfaces are precision finished and all tolerances are ABEC 5. The bearing is offered in both chrome-alloy bearing steel (SAE 52100) and 440 stainless and weighs ¼ gram.



WHEEL-TRUEING DIAMOND-MISER is offered by Wheel Trueing Tool Co., Detroit, Mich. The toolholder is an accessory for production-grinding machines which controls various aspects of the diamond wheel-dressing operation and prevents misuse and diamond wastage. The Diamond-Miser is a special diamond toolholder which is installed upon the grinding machine in a position which assures the diamond being presented to the wheel at the correct angle. Following each pass across the face of the grinding wheel, a metered indexing mechanism automatically rotates the diamond tool a predetermined number of degrees, assuring that no facet is ever re-used in identical form but is always turned just enough to present a new and perfect cutting edge to the grinding wheel.

Air Drying and Baking Primer Is Featured for All Metals

The Princeton Paint Laboratories, Princeton, N. J., offers Primer No. 10. The air drying and baking primer for all metals can be used on aluminum alloys, magnesium alloys, monel, tin, steel, copper, and galvanized metal, and can be applied by spray, dip, or brush. It is said to possess solvent resistance, as well as excellent salt water, chemical and weather resistance. Primer No. 10 eliminates pre-treating of metals. Degreasing is the only requirement.



Lehigh-Marton Cabinet Valve Has Pressure Regulator, Air Gage

Lehigh-Marton combination cabinet 4-way valve, Model 3MA13, with the handle in neutral position, has pressure regulator, lubricator, air gage and strainer. Over-all height is 9 5/16 in., width 7 5/16 in., and depth 4⅛ in. The rear air connection supplies air to the unit with two outlet connections from which to operate equipment such as a double-acting cylinder.

The panel face has a removable plug self-contained with an air strainer which is easily removed for cleaning. Lubricator internal surfaces are covered with a special white coating to reflect clearly the oil level.

A 200-psi. air pressure gage is provided, graduated in 5-lb. increments. A pressure-regulator adjusting knob is located on the left for increasing, decreasing and setting the air pressure desired for the functioning of shop apparatus. This regulator is capable of prompt regulation of pressure from 15 to 200 psi.

Precision Feed Controller Offers Auxiliary Control

National Pneumatic Co., Graybar Bldg., New York, N.Y., offers the Power-Check precision feed controller. This device, when nose-mounted through a bracket attached to the moving element of any feeding mechanism, can be employed to automatically retard speed and ease pressure at desired points of feed-travel.

If applied to pneumatic or manual drillpress feed, the Power-Check can be adjusted to retard the drill during the whole operation, or to ease the drill through at only the break-through point where most drill breakage occurs.

More ways to solve tooling problems . . .

BLACK & DECKER

the world's most diversified line of Portable Electric Tools!

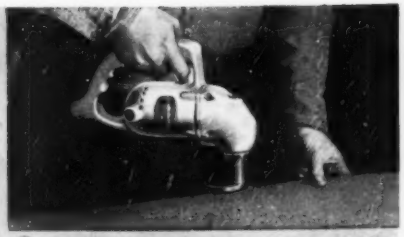
By *standardizing* on Black & Decker Tools, The Fingles Company of Baltimore, Md., has saved time and money on scores of jobs like those shown here. As a custom sheet metal shop, Fingles needs versatile tools to handle a wide range of jobs in the shop and on outside installations. Black & Decker "universal" tools give them this versatility —plus expert repair service from a convenient B&D Factory Service Branch to keep their tools in top production form.

Black & Decker builds over 100 Electric Tools —*more* tools, *more* models than any other manufacturer. And *every* B&D Tool is quality-built, engineered and powered to *turn out better work, with less effort, at lower cost!* Let your nearby B&D Distributor show *you* where you can cut costs by standardizing on Black & Decker, as thousands of other companies have done. Write today for our detailed catalog to: The Black & Decker Mfg. Co., 616 Pennsylvania Ave., Towson 4, Md.

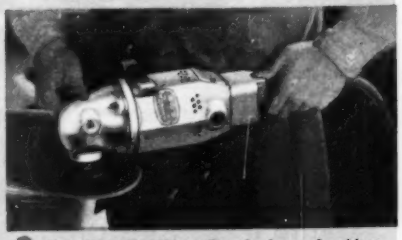
LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

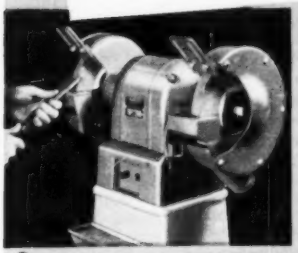


Clean-cutting B&D Electric Porto-Shear, cutting 16-gage stainless steel here, has cutting action always visible.

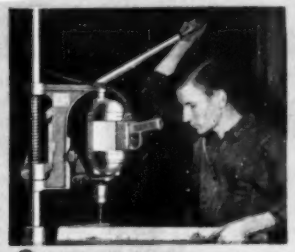


Versatile B&D 7" Heavy-Duty Sander sands cabinet corner. Same tool grinds, wire brushes, planes wood.

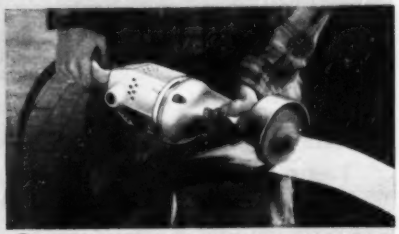
B&D Electric Hammer, shown here drilling in tile for installing toggle bolts, drives many kinds of tools.



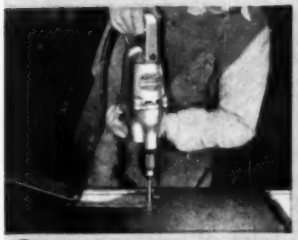
The Fingles Co. uses a B&D Bench Grinder for grinding down welds, beveling edges on stainless steel, sharpening tools.



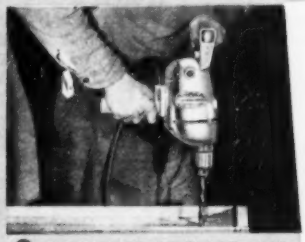
B&D Drill Stands give extra leverage, extra precision. This ½" Drill and No. 60 Drill Stand are drilling a ½" hole in an angle iron frame.



Perfectly-balanced B&D 4" Portable Grinder grinds weld on exhaust fan collar.



B&D Electric Tapper tapping holes in 11-gage cabinet. B&D line also includes 19 Screw Driver and Nut Runner models for speedy assembly.



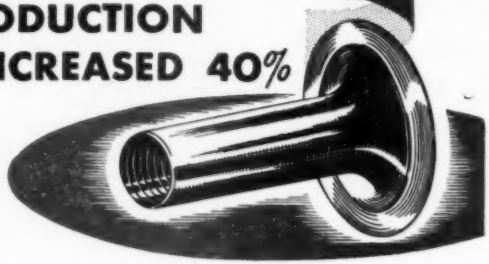
B&D ¼" Standard Drill drilling holes in 10-gage frame. Other B&D Drills from ¼" to 1¼", in Standard and Heavy-Duty models.

Standardize on BLACK & DECKER for . . .

- Wide choice of tools, wide choice of models.
- Quality-built features like powerful B&D-built motors, each "tailor-made" for the tool it drives.
- Convenient interchangeability of parts.
- Expert service on replacement parts and repairs from any one of 27 B&D Factory Service Branches.
- Sound advice on tooling problems from a nearby B&D Distributor.

HERE'S HOW...

PRODUCTION WAS INCREASED 40%



costly lab treated taps produced 15,000 threaded holes per tap
HY-PRO ENGINEERING cut tap costs and increased production to 21,000

PART: Pressed steel tubular nut.

PROBLEM: A leading special products manufacturer was tapping with a 5/16 – 18 spiral point tap to a depth of 3/4" full thread in tough, stringy steel. To average 15,000 holes per tap, many required lapping to size and all were specially surface treated. A costly, time-consuming process for the user.

Then they called in a Hy-Pro Engineer.

HY-PRO SOLUTION: He recommended a Hy-Pro quality controlled 5/16 – 18 spiral point tap with an exclusive Hy-Pro surface treatment that provides longer wear and proper lubrication. Production now consistently runs 21,000 threaded holes per Hy-Pro tap — *and* they are used without modification.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.

Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

HY-PRO TAPS

HY-PRO TOOL CO.
NEW BEDFORD, MASSACHUSETTS
A SUBSIDIARY OF CONTINENTAL SCREW COMPANY

ROUND TABLE Discussion

SHOULD SUGGESTIONS BE SCREENED?

My experience with the working of a suggestion scheme would tend to confirm Al in his opinion that the absolute suggestion box is the ideal.

In the plant in which I worked, all suggesitons were written on special paper, which bore an identification number, and were then placed in a box. The suggestions were periodically collected by the responsible official and a tiny résumé of each entered in a book under the appropriate reference number. The officer, who was an engineer of considerable experience, then assessed the value of the various ideas, and when in doubt contacted the foreman who would be most directly concerned and obtained his opinion, although it was not known from what section the suggestion came.

At stated intervals, a meeting was held to consider the ideas. Personnel attending this meeting consisted of the works director, works manager and senior foremen. Each idea was considered in turn by the committee, and the foreman most directly concerned could then give his opinion, favorable or otherwise, but the final discussion rested with the committee, who were all experienced engineers.

By this means, all that was of value was obtained and the preliminary assessing by the responsible officer prevented much time being wasted on what Ed would call "petty ideas," although each was considered on its merits.

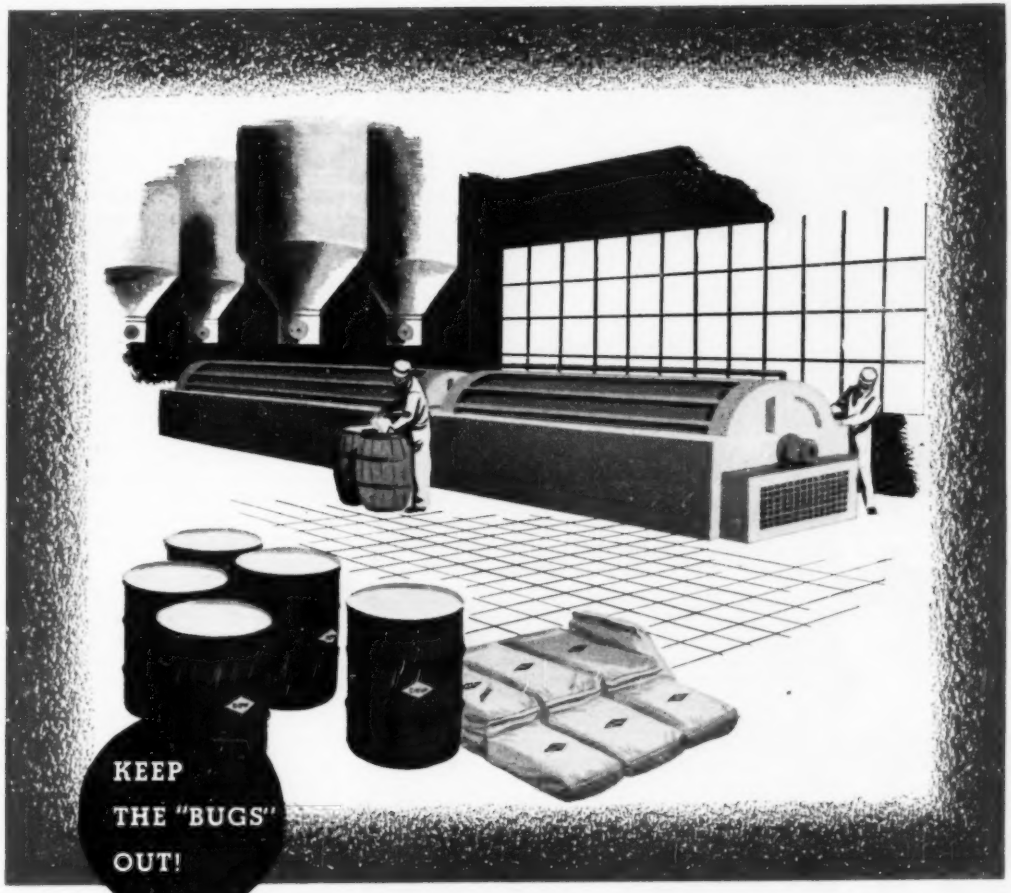
T. R. Harris
Cornwall, England

•

GOOD MORNING TO YOU

Ed's reluctance to believe in the dividends to be gained from regular indulgence in the byplay of "Good Mornings" is readily understandable. Not that it is easy to put your finger on the single specific reason, because there are more than one.

For years, overlapping several generations, we of the western world, because of a higher pace seemingly demanded by our design for living—of crowding as much as possible for material gain into each day—have had to push aside those



Dowicides control waste!

Production men everywhere now rely on the Dowicides for extending the service life of cutting, grinding, rolling and hydraulic soluble oil emulsions—by preventing bacterial decomposition.

Because the Dowicides are available in both oil and water-soluble types, they are ideally suited to incorporation with these oils and emulsions as protection against bacteria and fungi.

Why suffer costly material waste and production delays from lubricants and coolants going "sour"? The Dowicides offer effective, economical protection against microorganism attack. We welcome the opportunity to discuss your particular problem—*and its solution*—with you. Write or phone the nearest Dow Sales Office.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland
Detroit • Chicago • St. Louis • Houston • San Francisco
Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

Dowicides
GERMICIDES AND FUNGICIDES

DOW
CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

CLARK
"We 'comfort conditioned' our profits by using CLARK fork trucks"
COMFORT CONDITIONING by DUNHAM
Nothing is more conducive to managerial contentment and executive peace of mind than adding up the substantial savings effected by Clark Materials Handling Machines.
For example:
"Our Clark fork trucks cured several Materials Handling headaches, and stepped up productive capacity by speeding the flow of materials. Handling costs dropped more than 30 percent—substantial savings which, to use our own slogan, 'comfort conditioned' our profits. We find jobs for these machines—don't know how we ever got along without them."
F. E. Schmidt, Vice President
C. A. Dunham Company
Chicago, Illinois
There's strong likelihood that uncompromising examination of the average materials handling operation will disclose opportunities to make sizable cuts in costs, and rich promises that can be fulfilled quickly and most economically by a planned application of Clark's Modern Methods. And remember this: Clark builds both gas and electric battery-powered machines. You're sure of an unbiased recommendation when you CONSULT CLARK.
CLARK ELECTRIC AND GAS POWERED FORK TRUCKS
AND INDUSTRIAL TOWING TRACTORS
INDUSTRIAL TRUCK DIV., CLARK EQUIPMENT COMPANY BATTLE CREEK 3, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

items that don't hew right to the line. Omission of "please" from a ten-word telegram is on the face of it logical, good economics and efficient, inasmuch as it's one less series of signals to clutter up the wires. But, personally, in the face of all this, its absence is always conspicuous and the reaction towards a request that with the "please" left out becomes a command is definitely negative, a natural feeling in a race of individuals that won't be "pushed around."

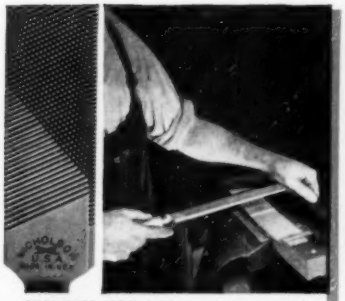
It's an attitude full of contradictions. The womenfolk, once the recipients of inborn gallantry from the men, present a paradox beyond understanding. They fill the "Letters to the Editor" columns of our dailies and periodicals with complaints of men's discourtesy by remaining seated on buses and streetcars, while the women stand—the absence of gestures of "After you" at every threshold—the failure to pick up and assist with bulky and dropped articles—and, no flaming wonder! Even the most courteous of males will rise only twice at the most and offer his seat or hold open a door with his foot (because his arms are full with his own shopping), while some lackadaisical female trundles herself past without so much as a glance, let alone a mumbled "Thanks"—or pick up a package, offer a helping hand to milady only to have her shout "Wolf!" "Fresh!" or floor him with a look for implying that she is "that" old.

It surely cannot be that we are all suspect, and for this reason each of us has taken the Golden Rule, "Do unto others. . . ." and put it under lock and key for fear of theft—or simply traded it in for the smart 1948 model "Do others before they do you." Or is it simply as the recent story goes of the foreigner who knocked over a man in the subway and began apologizing in the profuse manner of his country, only to be told: "Skip it, Bud, no one here has time for that sort of thing. If we stopped for courtesies we wouldn't get anything else done." Just then another train came in and again the same man was knocked down, but the crowd poured past, bearing the victim along and giving him only time to shout back "See what I mean?"

Do you suppose we all go through phases in which platitudes and homilies are alternately wise, tripe and then again the only words of wisdom?

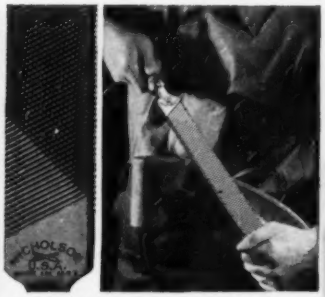
To return, though, to Ed's disbelief in the value of a smile and a "Good Morning" (for they do go hand in

Best Wishes
for better filing in 1949



STAINLESS STEEL FILE. Special-shape teeth to withstand high abrasive action of the tough chromium carbides and nickel alloy. Same types and sizes as regular-purpose files.

BRASS FILE. Short-angle "upcut" teeth prevent file running off work and keep file clear. Long-angle "overcut" breaks up filings. Flat and Half Round shapes, 8" to 12".



FOUNDRY FILE. Has extra-rugged teeth to resist breaking out. For fast metal removal on castings. Available in Flat and Half Round shapes, 8" to 14".

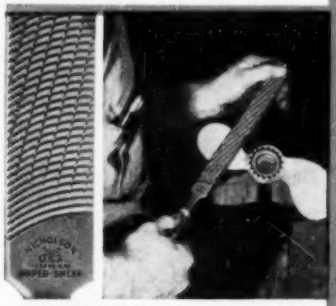
ALUMINUM "A" FILE. Special serrated-tooth and "open-throat" cut – to prevent clogging. For filing aluminum and other ductile metals. Flat and Half Round, 6" to 14".

IT ISN'T the cost of the file but the cost of the workman's time that counts in files and filing operations. Selecting *The right file for the job* is very important. Not only does it save time but it increases efficiency and reduces rejects.

Make your industrial distributor a helpful consultant on files as well as your supplier. *And be sure to send for "FILE FILOSOPHY"*—48 *intensely interesting pages on files. Every shop foreman needs a copy.*

NICHOLSON FILE COMPANY
29 Acorn St.
Providence 1, R. I.
(In Canada, Port Hope, Ont.)

LEAD FLOAT. Has coarse, short-angle teeth – a series of stubby "blades" which shear or "float" away metal. For lead, babbitt, pure copper. Flat and Half Round shapes.

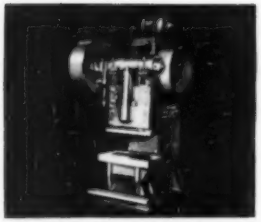


SUPER-SHEAR FILE. An exclusive milled curved-tooth file with teeth in off-center arcs, for roughing and smoothing in one operation. Serrations break up filings. 8" to 14" lengths.

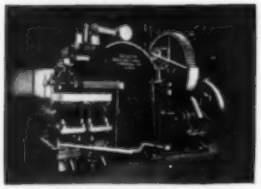
LONG ANGLE LATHE FILE. Teeth cut for clean-shearing–for fast, smooth finishing under light pressure. Made single cut on flat blanks in 6" to 14" lengths.

MILLED CURVED TOOTH FILE. Matchless in workmanship. Proper tooth face and rounded gullets minimize clogging. Shoulders lower than tooth tops permit use as surfacing tool.

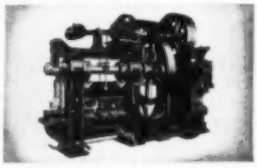
NICHOLSON FILES FOR EVERY PURPOSE



BEATTY Single End Punch available in capacities up to 200 ton.



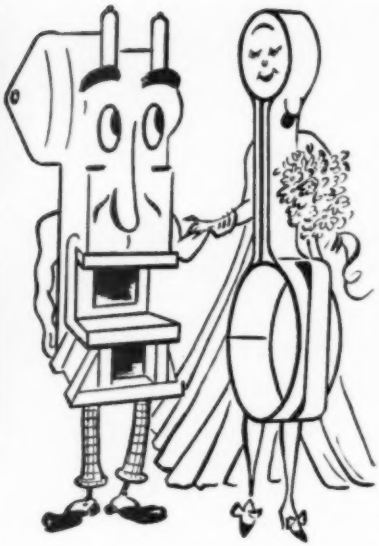
BEATTY No. 11-B Heavy Duty Punch for production tooling and use with BEATTY Spacing Table.



BEATTY Co-Pun-Shear — one unit does coping, punching, shearing.

BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.

BEATTY 250-ton Gap Type Press for forming, bending, flanging, pressing.



SHOTGUN WEDDING

Fast, low-cost production today demands machines correctly designed, correctly tooled for the specific job to be done. It *demands perfect mating* of machine to job, and this calls for the best engineering experience available to you. Here is where BEATTY ENGINEERING comes in. We know there is a BETTER way to do most production jobs. Our broad experience in finding that better way for so many companies is assurance that we can contribute to the solution of your problems. Write or phone us about your needs. Your best insurance for fast, quality production at a competitive cost is a BEATTY machine engineered to your specific needs.

HYDRAULIC METAL WORKING EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

hand). Of what use is a gruff greeting except as a storm-warning? And, after all, what workman really fears a storm? Supervisors get more work done by being liked than they do by trying to scare the devil out of everybody. Old, corny or trite, you can still "catch more flies with one drop of sugar than you can with a gallon of vinegar." Then, too, if Ed is not making a point of getting around at the first of the day to bid the boys "Good Morning," he's missing a golden opportunity to not only sell himself as a human being, further employee relations (one of his basic functions as a part of management), but also the best chance he'll have that day or any other of finding out just what each man is feeling and thinking.

No, definitely Ed this time is wrong and to others like him it is suggested they read and inwardly digest the following issued by one of the nation's raliroads, author apparently unknown:

A SMILE

A smile costs nothing, but gives much. It enriches those who receive, without making poorer those who give. It takes but a moment, but the memory of it sometimes lasts forever. None of us is so rich or mighty that he can get along without it, and none is so poor but that he can be made rich by it. A smile creates happiness in the home, fosters goodwill in business and is the countersign of friendship. It brings rest to the weary, cheer to the discouraged, sunshine to the sad and it is nature's best antidote for trouble. It cannot be bought, begged, borrowed or stolen, for it is something that is of no value until it is given away. Some people are too tired to give a smile. Give them one of yours, as none needs a smile so much as he who has no more to give.

A. M. Elliott
LeRoy, N. Y.

•

I don't believe that Al's men would care for his "Good Morning!" If he has about 40 to 50 men, he would find that quite a few, when they saw him coming, would disappear until he had passed their machines, especially one or two who were grouchy first thing in the morning —also any of them who might be displeased with their boss if he had found any reason at all to bawl them out the previous day.

There is another point too. During my long experience as supervisor, there never was a morning in the first hour of work when some prob-

WAREHOUSE STOCK

Why they think of WARD when it's SPRING STEEL

- **BLUE TEMPERED SPRING STEEL**
  Many Hundreds of Sizes
  .002" to .065" in thickness — .95 to 1.05
  Carbon — 48-51 Rockwell
- **COLD ROLLED ANNEALED SPRING STEEL**
  .003" to .183" in thickness — .70 to .80 Carbon
  — .90 to 1.05 Carbon

CLOSE TO A THOUSAND SIZES IN STOCK — AND COMPLETE SLITTING AND SHEARING EQUIPMENT ENABLE US TO FILL PROMPTLY THE MAJORITY OF ORDERS RECEIVED

•

WAREHOUSE SHIPMENTS ONLY ON THE ABOVE SPRING STEELS. NO EXPORT ORDERS.

•

Distributors

MILLER STEEL CO., INC.
40-50 Montgomery Ave.,
Hillside 5, N. J.
Telephone—New Jersey—WAverly 3-8000
New York—REctor 2-6263

EDGCOMB STEEL OF NEW ENGLAND, INC.
Milford, Conecticut
Telephone—MILford 4-1631

PRECISION STEEL WAREHOUSE, INC.
4409-4425 W. Kinzie Street
Chicago 24, Illinois
Telephone—COLumbus 2702

R. E. DEUTSCHE
765 Hampden Avenue
St. Paul 4, Minnesota
Telephone—NEStor 7279

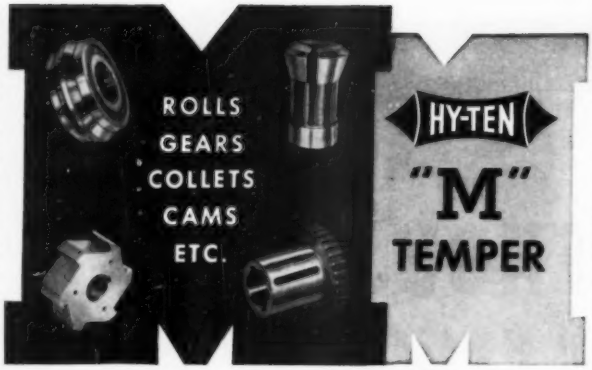
WARD STEEL CO.

TELEPHONES
Liberty 2-2770, Boston 10, Mass.
GASpee 8573, Providence, R. I.

49 FARNSWORTH ST. BOSTON 10, MASS.

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS.

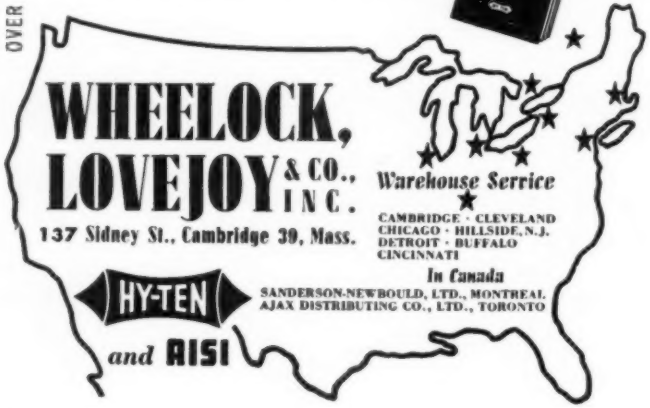


THE ALLOY STEEL THAT'S *MEANT FOR PUNISHMENT*

"M" TEMPER oil hardening steel was developed specifically for such vital, punishment-taking parts as dies, cams, collets, forming rolls, clutches, gears, etc. "M" TEMPER effectively combines high hardness with maximum toughness, minimum distortion, extreme density and great strength – properties that ideally combine to resist wear and breakage. This grade develops the advantages of the powerful alloys – chromium, nickel and molybdenum. Moreover, "M" TEMPER has excellent forging properties and is readily machinable in the annealed condition. Although low in cost, "M" TEMPER has non-deforming properties comparable to, and in many cases superior to, much more expensive steels.

WL *steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability—thus eliminating costly changes in heat treating specifications.*

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.



WHEELOCK, LOVEJOY & CO., INC.

137 Sidney St., Cambridge 39, Mass.

Warehouse Service

CAMBRIDGE · CLEVELAND
CHICAGO · HILLSIDE, N.J.
DETROIT · BUFFALO
CINCINNATI

In Canada

SANDERSON-NEWBOULD, LTD., MONTREAL
AJAX DISTRIBUTING CO., LTD., TORONTO

HY-TEN and AISI

lem didn't crop up to occupy all my time and attention. This I would consider of far more importance than going around individually wishing everyone good morning.

The personal touch can be carried too far, just as a foreman can be too aloof. I believe the "Good Morning" routine to each individual is archaic and has no influence at all in any way in making men more contented or satisfied.

Breakfast-table grouches do definitely make a difference on the first hour or so of the day's work. Production definitely is less than when a man goes to work happy and contented. When a man feels grouchy, he is better left alone for a while.

I venture to say that if Al will review in his mind, after he leaves work, the progress made during the day on every job, he will find that production on several parts is not up to requirement and requires his personal attention the first thing in the morning. Production schedules far outweigh in importance the making of a parade to say "Good Morning" to each employee.

Arthur Silvester
Niantic, Conn.

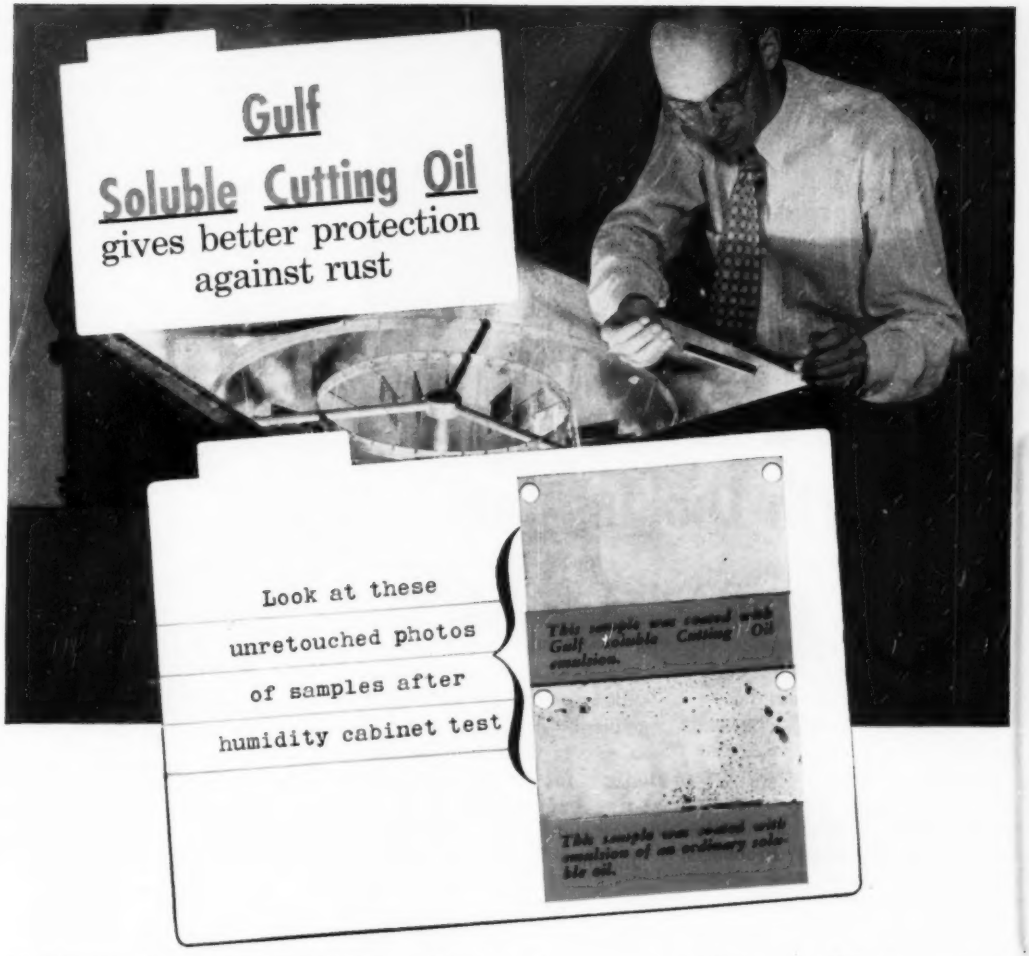
•

To paraphrase Shakespeare, "The goodness of the 'Good Morning' routine works both ways and is twice blessed; it blesseth him that gives and him that receives."

To claim that the routine is archaic and impractical is neglecting a recognized basic psychological force for good shop labor relations. When the foreman remembers the added courtesy of greeting every one of his workers in the morning, he is insuring increased interest of the men in their work and demonstrating the friendly attitude of management. Under no circumstances can passing the time of day be construed as a waste of time. It should be the accepted manner for getting the working day off to a good start, and indicating to the men that the foreman has their interest at heart.

The shop men are not the only beneficiaries of that ambassador of good-will, the "Good Morning" routine. The foreman gains the satisfaction of knowing that he is doing his part in starting them out with a feeling that they are human beings, not machines. In addition, it gives him an opportunity, as he makes the rounds, of spotting conditions that he might be unaware of otherwise.

Furthermore, the routine is a good way to work off "breakfast-table grouches" and so prevent them from disrupting the working day. It helps


Gulf
Soluble Cutting Oil
gives better protection
against rust
Look at these
unretouched photos
of samples after
humidity cabinet test
This sample was coated with Gulf Soluble Cutting Oil emulsion.
This sample was coated with emulsion of an ordinary soluble oil.

Here's protection for metal parts being machined in your shop! The excellent rust preventive properties of Gulf Soluble Cutting Oil prevent rust formation between processes or when the job is left on the machine. It keeps highly finished surfaces bright longer!

The two samples shown above tell the story! Both have been exposed to a controlled flow of 120° F. air saturated with water (Relative Humidity—100%) for a period of more than two hours.

Note the startling difference! The sample coated with an emulsion of Gulf Soluble Cutting Oil shows no signs of rust formation even at the plate corners, which are more difficult to protect. The sample coated with an ordinary soluble oil emulsion is spotted with rust marks, many of which have marred the surface permanently.

This is another important plus value of Gulf Soluble Cutting Oil. For further information write, wire, or phone your nearest Gulf office.

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:
Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

Gulf Oil Corporation · Gulf Refining Company AM
3800 Gulf Building, Pittsburgh 30, Pa.
Please send me, without obligation, the material I have indicated below:

☐ Further information on Gulf Soluble Cutting Oil.
☐ Practical slide-rule-type calculator for help in maintaining desired soluble oil concentrations.

Name.....
Company.....
Title.....
Address.....

Here's a Tubing Center Worth Looking Into

Your nearby Ryerson plant is a handy tubing center where large, diversified stocks await your call. Do you need mechanical or pressure tubing — seamless or welded; stainless tubing, pipe or pipe fittings? Practically any tubing requirement can be shipped on short notice. You save time because Ryerson has a wide range of sizes at plants from coast to coast. Probably there's a Ryerson tubing center near you.

In addition to quick delivery, Ryerson tubing service often gives an added bonus of time saved in your shop. All Ryerson tubing meets high standards of size accuracy, concentricity, straightness and finish. Machining time is cut to a minimum.

There's an experienced tubular products specialist at your Ryerson plant—ready to work with you on any problem of application or fabrication. We urge you to send us your tubing inquiries and orders.

Joseph T. Ryerson & Son, Inc. Steel-Service Plants: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles, San Francisco.

Do you have a copy of the Ryerson Tubing booklet just off the press? Its 32 pages are packed with useful information on tubular products, both carbon and stainless—tolerances, mechanical properties, helpful suggestions on grades and sizes, Ryerson stocks, etc. Write for yours today.

PRINCIPAL PRODUCTS: Bars · Structurals · Plates Sheets · Tubing · Allegheny Stainless · Alloy Steels Reinforcing · Babbitt · Machinery & Tools · etc.

RYERSON STEEL

the foreman pack up his own early morning grouch in his old kit bag and greet the day with a smile. This procedure works both ways. In giving out to the men, the foreman relieves himself of his own troubles and gets the shop started on a pleasant basis, regardless of what happens later on in the day.

"Breakfast-table grouches" can disrupt the working day because they have a tendency to distort the reasoning power of the foreman in handling personnel matters or settling problems of work. They can lead to tactless criticism by the foreman where none would be given if he were in normal good humor. It should be remembered that any tactless criticism or calling down always humiliates the receiver so much that it usually does more harm than good. Tongue-lashings do more to distract employees from successful performance than almost any other factor.

Likewise, any foreman who allows himself to become involved in an argument with a subordinate is exposing his own incompetence. It is utterly impossible to argue anyone around to one's own point of view voluntarily. The other person is usually so busy trying to defend himself that he isn't even listening. Whenever any employee makes a mistake or does work below satisfactory standards, the shrewd foreman will not give him hell but will give him help to bring him up to standard. Nothing is achieved by making a man fail by riding him into a jittery state through unnecessary criticism.

A note of caution should be observed that the "good morning" routine not be overdone to the point where it encourages over-familiarity. Some foremen get the idea that the key to successful foremanship is popularity with the men. I know of one foreman who drank beer with the boys every afternoon after work to show that he was still a good fellow. On the job he winked at their violations of plant rules. Whenever disagreeable assignments had to be made he confided that he didn't like them either, but that the "Big Bosses" had ordered them. This man soon had to be replaced. Not only was the quality of his outfit's work slipping, but it was discovered that his men did not respect him. Being a good boss in the factory is not just a matter of being popular. It means having the ability to handle and inspire people and maintain respect and confidence.

A first-rate foreman will welcome the opportunity to greet his men and make them feel they are part of the company. A foreman cannot get the best work out of his men if he

Fast as a Streak

MAGIC TYPE

QUICK-CHANGE CHUCKS

A good stock of Quick-Change Chucks is maintained from which requirements for most sizes can be filled immediately. See pages 98-102 of Scully-Jones Catalog No. 500.

Save set-up time with this "Magic" Quick-Change Chuck. Presto-Change-O, you change tools in your Drill Presses, Vertical Tapping and Boring Machines . . . insert Drills, Reamers, Boring Bars, Counterbores, Core Drills, Taps or Special Tools, without stopping spindles!

When you raise locking ring, collet drops out automatically for a quick, safe tool change. Four styles of collets available —"AA", "A", "D" and "E" to accommodate various tools. Adds many stations to your machines.

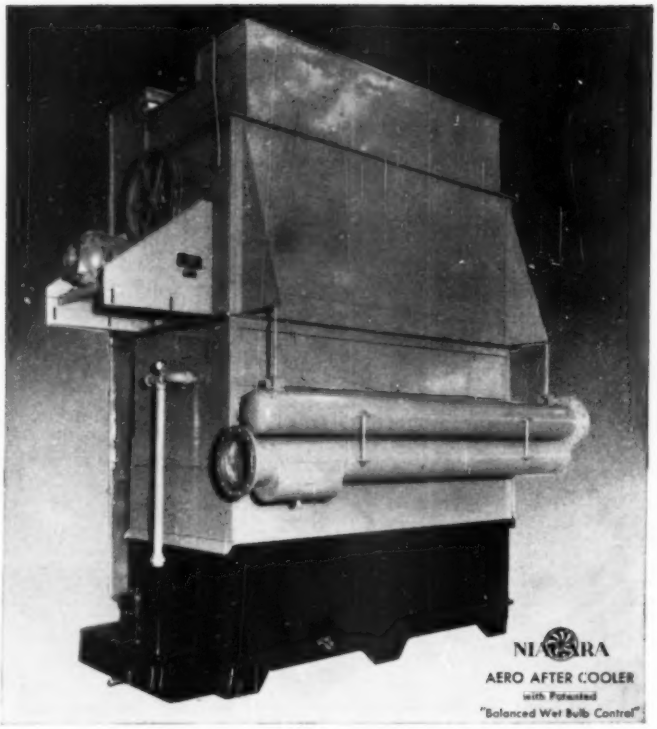
Consult our engineers on adapting "Magic" Quick-Change Chucks and Collets to your production problems. Send us your sketches or blue prints for recommendations and quotations.

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

B-2140

1902 SOUTH ROCKWELL STREET • CHICAGO 8, U.S.A.



How to PREVENT CONDENSATION in COMPRESSED AIR LINES

● Users of pneumatic tools and machinery spend thousands of dollars on repairs and suffer much interruption to production from the condensation of water in their air lines. In compressed gas systems and in processes where compressed air is blown directly on parts and materials in production, there is additional damage.

You can prevent these losses by installing a Niagara Aero After Cooler. It cools the compressed air or gas by evaporative cooling and removes the water before the air enters the receiver. This method brings the air to within a few degrees of the wet bulb temperature, making certain that your compressed air will always be colder than the atmosphere surrounding the lines in your plant, so that no further condensation can take place.

Savings in cooling water pay for the installation. Experience shows that the patented Niagara evaporative cooling method consumes less than 5% of the water required for cooling by conventional means. You save the cost of the water, the cost of pumping it, the cost of disposing of it. These extra savings soon pay for the Niagara Aero After Cooler.

Write for Bulletin No. 98AM

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

405 Lexington Ave. New York 17, N.Y.

District Engineers in Principal Cities

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

neglects them. A small thing like a pleasant good morning greeting counteracts any feeling of neglect or imagined discrimination and makes the men feel more proud of themselves. A good foreman treats each man as an important individual and helps him to feel that his best effort will be important to the company. This is the essence of good leadership.

What other people want most of all is a friendly greeting and a word of praise or appreciation. It gives them a sense of personal achievement. Even the sourest grouch secretly yearns for a little honest recognition and humane consideration from his boss. A wise foreman is able to find something to commend in even the least competent man in his outfit, and honest recognition of the merits of his good men. A foreman will find that he will get good results from people when he starts thinking in terms of what they want, instead of what he wants.

There are those who state that the "Good Morning" routine is a form of coddling an employee by treating him nice he will walk all over you. That is the old fear of a foreman who is unsure of himself. Just ask these objectors if they respond to someone who is nice to them by walking all over him. The invariable answer will be in the negative.

A good way to turn a usual day into a most unusual day is to start it off with a round of good-will-producing good mornings. A pleasant greeting will change many an early-morning grouch into an early morning angel.

Harry Kaufman
Philadelphia, Pa.

•

The qualities that make up a good foreman are, in many respects, similar to those of a good salesman. Both are selling a product; both depend a great deal on other people, and their own ability to handle them.

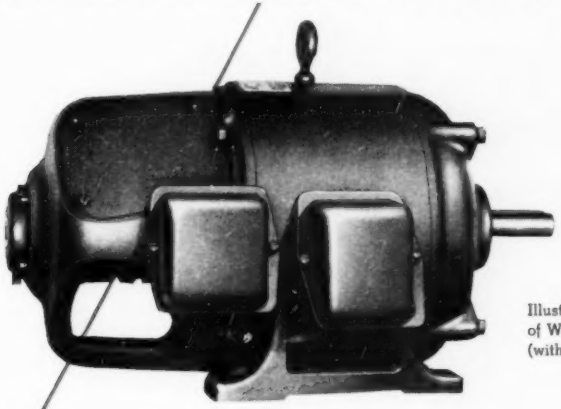
A foreman must sell good will just as a salesman does. Gone are the days when shouting and bullying were the order of the day. As a nation we are more intelligent today than we were thirty years ago. We are human beings, and wish to be treated as such, and a pleasant "Good Morning" is the correct start in that direction.

A successful businessman would not think of ignoring his customers, or talking gruffly to them, nor would he lose any opportunity to create good will, for he knows that to remain successful he must main-

Century

WOUND ROTOR MACHINES

Are Available for *MANY* Industrial Uses . . .



Illustrating Century Line of Wound Rotor Machines (with covers).

For *Compressors • Cranes • Hoists • Bending Rolls • Refrigerators • Bridges • Synchro-Speed Drives • Printing Presses • High Frequency Current*

Century Polyphase Wound Rotor machines are adaptable to many applications that require

1. Adjustable varying speeds or reversing direction of rotation — such as bending rolls, fans and blowers, newspaper printing presses, etc.
2. Synchro-speed, multiple drives to be used when two or more industrial operations must be synchronized.
3. Converters — to supply high frequency current for high speed electric motor-driven machines and hand tools.
4. High starting torque with low starting current — for such applications as cranes, hoists, lift bridges, turn tables and car dumps.

Century Electric Wound Rotor Machines are built in sizes up to 400 horsepower and are available in open protected or splash proof frames.

Century builds a complete line of electric motors in a wide range of types and kinds, in sizes from 1/6 to 400 horsepower.

Century C MOTORS

Specify Century motors for all your electric power requirements.

Popular types and ratings are available from factory and branch office stocks.

CENTURY ELECTRIC COMPANY • 1806 Pine St. • St. Louis 3, Mo.

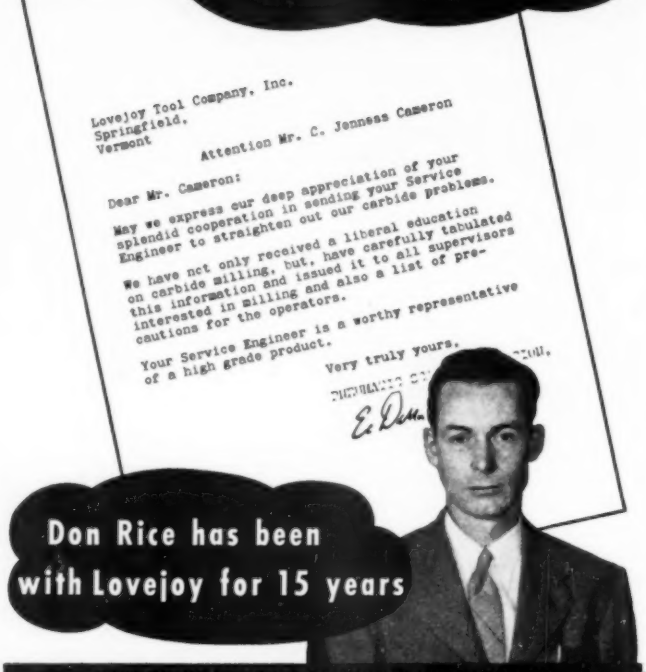
Offices and Stock Points in Principal Cities

CE-603

LOVEJOY SERVICE ENGINEERS

. . . always ready to assist you with your milling and cutter grinding problems

Don Proctor has been with Lovejoy for 31 years



Lovejoy Tool Company, Inc.
Springfield,
Vermont

Attention Mr. C. Jenness Cameron

Dear Mr. Cameron:

May we express our deep appreciation of your splendid cooperation in sending your Service Engineer to straighten out our carbide problems.

We have not only received a liberal education on carbide milling, but, have carefully tabulated this information and issued it to all supervisors interested in milling and also a list of precautions for the operators.

Your Service Engineer is a worthy representative of a high grade product.

Very truly yours,

Don Rice has been with Lovejoy for 15 years

CALL THE HOME OFFICE OR YOUR NEAREST LOVEJOY REPRESENTATIVE FOR DETAILS

Almquist Bros.
Los Angeles 11, Calif.

L. A. Benson Co.
Baltimore 2, Md.
Charlotte, N. C.

Burleigh-Stacker Mach. Co.
Pleasant Ridge, Mich.

A. M. David
West Hartford, Conn.

John DiEugenio
Phoenix, Arizona
Denver 6, Colo.

Eastern Carbide Corp.
New Rochelle, N. Y.

Elffeldt Mach. & Supply Co.
Kansas City 6, Mo.

Joseph E. Fletcher
San Francisco 3, Calif.

Walter F. Greene
Indianapolis 8, Ind.

L. V. Swartz
Dayton, Ohio

Walter R. Hammond Co.
Minneapolis 15, Minn.

Harris Pump & Supply Co.
S. S. Pittsburgh 3, Penn.

C. J. Harter, Machinery
Dallas & Houston, Texas

Industrial Equip. Co.
Tulsa 1, Oklahoma

G. E. Jones
Detroit 21, Michigan

W. H. Jones
Norwood, Penn.

Austin Ford Logan
Buffalo 2, N. Y.
Cleveland 3, Ohio
Syracuse 3, N. Y.

Production Products Co.
Seattle 4, Washington

R. H. Roempies
Lombard, Illinois

K. P. Wesseling Co.
St. Louis 3, Missouri

Williams-Collins, Inc.
Milwaukee 3, Wisconsin

Geo. E. Zweifel & Co.
Portland 4, Oregon

LOVEJOY TOOL COMPANY, INC.
SPRINGFIELD, VERMONT, U. S. A.

tain that all-important good will.

This good will is just as important to a foreman who must have it from those working for him, to obtain their utmost loyalty and efficiency. This in turn results in good work at minimum cost, a fact which reflects in his operating budget.

People working under good conditions are more cooperative, and often offer worthwhile suggestions which they would not bother to offer to a surly and unappreciative foreman.

This does not mean that a foreman must lean over backward, and let his men run roughshod over him. Discipline must be maintained at all times, but if he is fair and just in all his dealings with them, whether in criticism or praise, in the measure in which it is deserved, he will gain the complete respect and loyalty of all his men.

Robert T. Knotek
University Hts. 18, Ohio

•

FACE-TO-FACE OR BACK-TO-BACK

The president, or owner, as the case may be, of a factory either respects his workers, or he doesn't. Either way his employees will know. He can't hide this, and a go-between won't cover up. Furthermore, I think direct contact won't cause a lack of respect for him. In this locality, personal contact is still the custom.

What does make the executive rise in the esteem of his personnel is what he says or does, or in other words, his policies. In one instance, a president appeared to address his "people," but only to talk about the terms of a labor contract by which they didn't gain anything. So here this "direct contact" didn't increase the president's popularity—it just showed his lack of fear of his employees.

The only thing is, that if a president of a company, or a general manager, does not make personal appearances, his personality is more remote to the employees, and he is cursed or blessed behind those closed doors.

Edward Diskavich
Torrington, Conn.

•

Time was when the "brass" of a concern felt that they should keep any bit of information within the sacred circle, and, if an item became general knowledge throughout the organization, the person who was responsible for the leak was severely admonished or summarily fired.

Back in those dark days, one very

ALLIED PRODUCTS CORPORATION

Top-notch manufacturing facilities are important, certainly . . . and Allied has them in four completely equipped plants. What is more important, however, is manufacturing *ability* which should be reflected in every phase of operation. Perhaps this is recognized in the skilled, capable hands of machine operators . . . but that is only part of the picture. Capable hands directed by intelligent thinking must be at work in *every* department—management, engineering, production, and even where routine clerical work is done.

You'll find the picture complete at Allied.

ALLIED PRODUCTS CORPORATION
DEPARTMENT 43
4612 LAWTON AVENUE • DETROIT 8, MICHIGAN

HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS
SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM-HEATED PLASTIC
MOLDS • SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

Quick Delivery on Cast Bronze Bearings

— *Here is Good News* for manufacturers of all types of equipment. Now you can secure all your requirements in cast bronze bearings . . . particularly in the larger sizes . . . in *days* . . . not months. Our new and enlarged facilities plus new equipment and new methods have made this excellent delivery possible.

On standard stock items . . . UNIVERSAL Bronze Bars, G. P. Bearings, Electric Motor Bearings . . . *we* can ship your order the day it is received.

Why not check your requirements NOW? Send us your prints and your specifications. Remember, Johnson Bronze makes every type of Sleeve Bearing . . . an unfailing source of supply with the highest reputation for quality. Write, wire or call—TODAY.

JOHNSON BRONZE COMPANY
515 South Mill Street - - - - - New Castle, Pa.

Call
Johnson Bronze
at Atlanta • Cambridge, Mass. • Baltimore • Buffalo • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Kansas City, Mo. • Los Angeles • Minneapolis • New York • Newark • Philadelphia • Pittsburgh • St. Louis • San Francisco • Seattle.

JOHNSON BRONZE
SLEEVE BEARING HEADQUARTERS
BRANCHES IN 20 INDUSTRIAL CENTERS

astute businessman once wrote, "A padlock on the mouth adds to the face value of a man." But there were exceptions; for example: Philip Armour was well on his way up. When he was in Chicago, he would go to his office at a very early hour in the morning. Once when he was particularly early, he found a bookkeeper busy over his figures.

"Do you always get in as early as this?" inquired Mr. Armour.

"Yes, sir, whenever I know you are in town, sir!"

That remark made a bull's-eye, for that young man was advanced rapidly.

Those were the days when all a man had to sell, was his manual labor. Today he is better educated and sells effort and knowledge also. The attitude of employers has changed, and the general run of employees know many items of information about their employers which, formerly, were kept confidential.

It is a matter of statistics that no man ever spoke to a larger audience than did the late President Roosevelt when he spoke directly to the people in his fireside chats. It was the "Big Boss" speaking, and the people listened and loved it.

The boss who comes directly to his men with his hopes and ambitions for both himself and them, will never suffer the misunderstandings of the firm which employs a skilled go-between, no matter how well trained he may be. No, definitely, the old-time direct method such as Charley Schwab practiced is not obsolete.

Communism will never get a toehold in a shop where the men know they are working for a boss who cares enough for the workers under his direction to give them an opportunity to state their troubles, hopes and ambitions, nor need he fear the breaking down of any influence he may have by coming among them.

By giving everybody in his employ the low-down in regard to the many subjects which interest employees, Billings is simply fulfilling a need. This overcomes prejudice and obstinacy which may permeate a large part of any organization.

As an example of good relations between management and employees, a large corporation has a manager (he is a multi-millionaire) who can spot a new man, almost without exception, the first time the latter is around the plant.

The manager will stop, give the man a few words of welcome, learn something about the man's personality, say he hopes he will like the job. The next time they meet he

Bodine

CASE HISTORY No. 23

Processing a brass hub used in the famous Erector Set made by A. C. Gilbert Co.

1 HAND LOAD SCREW MACHINE BLANK TO DIAL.

2 SPOT DRILL AND C'SINK FOR SET SCREW HOLE.

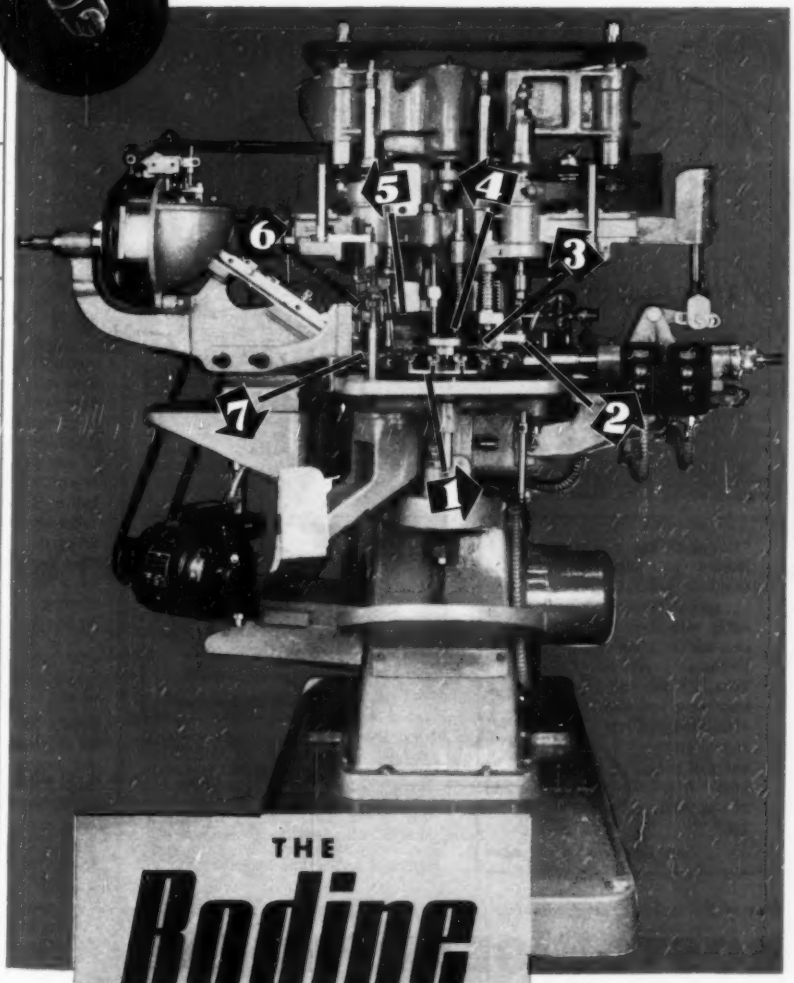
3 DRILL No. 33 SET SCREW HOLE.

4 TAP 6-32 SET SCREW HOLE.

5 CROSS REAM .161 DIA. SHAFT HOLE TO SIZE, REMOVE BURRS WITH HORIZONTAL DRILL SPINDLE.

6 HOPPER FEED AND INSERT No. 6-32 SCREW IN TAPPED HOLE.

7 AUTOMATICALLY INSPECT AND EJECT.



THE

Bodine

CORPORATION

BRIDGEPORT 5 CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

"You Can't Meet Tomorrow's Competition with Yesterday's Machine Tools."

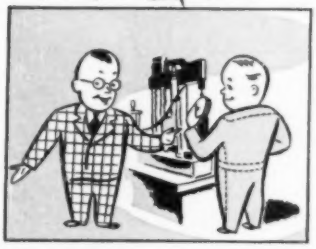
PRODUCTION: Completely automatic except for loading. No. 40-10 Bodine machine produces 2400 pieces (12,000 operations) per hour. Perhaps a Bodine machine (6 standard sizes) can be tooled to produce some of your components. Why not investigate.

SEND FOR BULLETIN

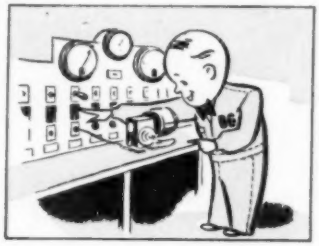
BBD48

"It's QUALITY CONTROL that sold me on Boston Gears!"

"67 years of experience give Boston Gear Works a big edge in know-how and craftsmanship. They've worked out processes and techniques that build *extra* quality into their products."

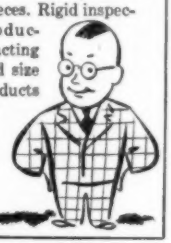


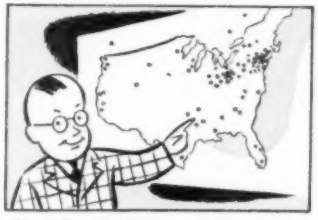
"Everything is checked and tested. Boston Gear controls its own materials and alloys . . . uses only virgin metals . . . tests its materials for hardness and tensile strength . . . tests its products for shock strength, hardness and wear."



"Every craftsman is an Inspector . . . makes sure previous operation is properly done before he starts . . . inspects his entire run and he's double checked by our elaborate Central Testing Lab."

"Engineers can design around Boston Gear stock parts with complete assurance of success . . . manufacturers can cut costs *safely* with these mass production masterpieces. Rigid inspection of all production for exacting tolerances and size of finished products is your guarantee of perfect interchangeability."



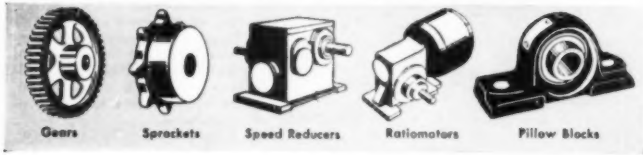


"And Boston Gear products are sold coast to coast through 71 DISTRIBUTORS. There's one within fast shipping time of *your* plant . . . and you can now buy most Boston Gear products *right off the shelf!* See our THOMAS' REGISTER insert under Gears & Pinions for your nearest source . . . or write for list of Authorized Distributors.

One of the world's most complete lines . . . 71 Distributors in major cities

BOSTON GEAR WORKS

64 Hayward St., Quincy 71, Mass.



can call the man by his first name. This may be out of the ordinary, but it gets loyalty and production.

Considering all facets of this subject, I cannot agree with Ed's last remark, "All these guys are interested in is the do-re-me."

F. H. Stebbins
Worcester, N. Y.

•

REST FOR THE WEARY

Having spent 15 years of my working life standing in front of lathes in many parts of the world, I am strongly in favor of seats for lathe operators. My standing has given me a fine crop of varicose veins, a pair of fallen arches and poor circulation in the lower limbs.

No lathe operator wants to sit when he is thread cutting, form turning or quickly changing tools to perform a multitude of operations on a small job, but there is no logical reason why he should not take the weight off his feet during a prolonged cut on a big job.

One expects logic to prevail in a scientific business like mechanical engineering, but machine shops are generally cluttered with traditional practices. I recall, when I was an apprentice, earning my foreman's displeasure because I hoisted the seat of my pants on to the top of a cupboard when taking a long cut in the lathe. I was assured that a sitting lathe operator was devoid of all manly virtue. The fact that the machine was hard at work turning out swarf at a fine rate made no difference. Sitting was taboo and just not done in the best-regulated establishments. I was never allowed to sit at any job during the nine years that I worked for that company.

The fatigue of lathe operating arises from the necessity of standing in a space of about 1 sq. ft. in area for hours on end, without any flexing of the knee and ankle joints. Any lathe worker will emphatically agree that walking is infinitely less tiring than uninterrupted standing in one spot. Shop foremen who are constantly on the move think they have the most leg-wearying job, which no doubt makes them unsympathetic to lathe workers' discomforts.

Tests to find out more about machine-operator fatigue during the war revealed that tiredness manifested itself in a shuffling and constant changing of the position of the operator's feet. The movement increased as the working period lengthened and production fell in direct proportion to the number of foot movements. The provision of seats for all

PRODUCTO *Special* DIE SETS

controlled FROM FOUNDRY *to* FINISH

When your order for a Special Die Set comes to Producto it starts a smoothly controlled cycle of production from Molten Semi-Steel in our Foundry or Flame Cut Steel Plate through a machining line especially developed for this specific purpose. Overhead cranes shift the huge parts like you'd handle picture puzzle pieces. Immense Magnetic Chucks hold them vertically while a Hanchett Grinder works the surface to a silken finish. A Producto designed Jig Borer machines 3½" diameter holes with complete accuracy.

Yes, your special die set is in good hands . . . craftmen's hands, guiding precision machinery thru close tolerance production.

No finer die sets can be made . . . or made so promptly . . . sufficient reason for you to call Producto "Near Neighbor Service."

MANUFACTURERS OF STANDARD OR SPECIAL DIE SETS

THE PRODUCTO MACHINE COMPANY
990 HOUSATONIC AVE., BRIDGEPORT 1, CONN., TEL. 4-9481

ATLANTA Main 4451
BALTIMORE Plaza 0340
BIRMINGHAM 54-9521
BUFFALO Cleveland 1110
CAMDEN, N. J. 4-7765
CHICAGO Central 6680
CLEVELAND Superior 6159
DAYTON Madison 5361
DETROIT Walnut 1-3101
ELMIRA 5168
ERIE 5-4375
GREENSBORO, N. C. 2-0608
INDIANAPOLIS Franklin 3508
LOS ANGELES Trinity 9826
MIAMI 3-2384
MONTREAL MA. 5346
NEW YORK Worth 4-7484
PHILADELPHIA Lombard 3-4482
PITTSBURGH Atlantic 4116
ROCHESTER Main 5249
ST. LOUIS Jefferson 4805
SAN FRANCISCO Exbrook 2-2230
SYRACUSE 3-1181
TORONTO Hudson 9071
YORK, PA. 2042

6PD48

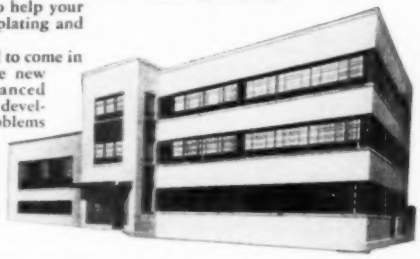
Here is ***your*** *New Laboratory*

Now, for you to use . . . this completely equipped, modern laboratory just opened by the Hanson-Van Winkle-Munning Company in Matawan, New Jersey.

This new laboratory was built for you. Here, at your disposal, is the latest apparatus for testing and developing new processes and applications in the electroplating and polishing field. Here, highly trained, efficient technicians are at your service to help your company solve individual plating and polishing problems.

You are cordially invited to come in and thoroughly inspect the new laboratory with its advanced equipment for research and development. Bring your problems with you . . . plating solutions for analysis, electrodeposition difficulties for investigation, buffing and coloring compositions for testing, any other pertinent problems, whatever their nature.

This new, outstanding customer service is just one more example of Hanson-Van Winkle-Munning's leadership . . . why H-VW-M is known as "Headquarters for the Electroplating and Polishing Industry."



4876

HANSON-VAN WINKLE-MUNNING COMPANY
MATAWAN, NEW JERSEY
Manufacturers of a complete line of electroplating and polishing equipment and supplies
Plants: Matawan, New Jersey • Anderson, Indiana
Sales Offices: Anderson • Chicago • Cleveland • Dayton • Detroit • Grand Rapids • Matawan • Milwaukee
New Haven • New York • Philadelphia • Pittsburgh • Rochester • Springfield (Mass.) • Stratford (Conn.) • Utica

Sewall GEARS

CUSTOM MADE
For EVERY NEED

For best results, get in touch with Sewall engineers while your product is still on the drawing board. Close tolerances are efficiently maintained in the production of racks... sprockets . . . spur . . . spiral . . . bevel . . . Zerol bevel . . . worm gears. We furnish prompt estimates on any quantity.

E. B. SEWALL MANUFACTURING CO.
688 Glendale St. St. Paul 4, Minnesota.

machine operators helped keep production at a more consistent level throughout the working period.

Resting by machine operators provided with seats consists of momentary periods of sitting, often only a few seconds duration. Fatigue is relieved by the mere change of position and the shifting of the body weight coupled with the flexing and bending of the foot and leg joints.

The best form of seat was found to be a high stool without a back rest, the seat height from the floor being 2 in. shorter than the length of the operator's legs. This size of stool enables the machine operator to sit or stand quickly and observe the action of the machine.

Over 20 years ago, Henry Ford said that no man stood up to do his job in a Ford plant if the job could be done just as well sitting down. The logic of this has been proved countless times since then—shop managements who disagree are either just pig-headed or ignorant.

Clifford T. Bower
London, England

•

This old and interesting question should be weighed carefully by the circumstances in the individual shop.

It can have quite an influence over efficiency and morale. I don't agree with the opinion of Ed. Let him try it and take the stools from older employees and see where he is. Right off, the men will get the idea the shop management has gone hard-boiled, that management is experimenting for more profit—to their eventual discomfort. The men will argue that sitting does not alter the speed of their machine or its efficiency and is essential in some cases at the drill, shaper, mill, planer, etc. Some die-makers just can't degree-file a small die unless sitting.

Let Ed box some circles and try to spot and drill the holes to within several thousandths at a drill or try to follow a curved line on a shaper and he will get the correct answer to the question.

Some years ago, I saw a plant making wire-forming machines (that is a case of small mass production) take all stools from the men and ruin the morale and efficiency of a 60-man machine shop. The owner never regained his former status or respect and in several years he sold out and the new owners moved the plant and left the men behind. This may be an extreme case. However, I trust it serves to deter any one like Ed from hasty action on the stool question.

Personally, I think when the stool

LUFKIN

for 65 years...

Preferred by Men Who Measure

Legions of Men Who Measure—expert craftsmen—have made this nation the envy of the world.

Tapes, rules and precision tools in the skilled hands of engineers, artisans and mechanics have made possible our highways—our motor cars—our homes filled with mechanical marvels.

During the past half century of our sky-rocketing industrial progress, the majority of "men who measure" have depended upon Lufkin to bring to their work truth in dimensions—the very basis of precision and quantity production. Industry's continuing demand for greater precision has been met by Lufkin with tools to meet the craftsmen's needs.

Confidence in Lufkin is a deserved tribute to their unending search for finer and still finer methods of producing dependable, accurate measuring instruments. These now total over a thousand types and styles, each one designed for a particular use.

The name of Lufkin is placed high among the nation's great industrial leaders—a name to be preferred when you buy instruments for precision measuring.

THE LUFKIN RULE COMPANY
Saginaw, Michigan

MEASURING TAPES

RULES

PRECISION TOOLS

ACCURACY OF MEASUREMENT IS THE KEY TO PRECISION

HEADSTOCK, enclosed, running in oil, lubricating the Timken Tapered Roller Bearings, the bull and small back gear, the back gear bearings and the lead screw reverse gears and bearings.

GEAR BOX, enclosed, running in oil, lubricating all the gears and bearings in the gear box, insuring carefree longer life, quieter operations. It doesn't hurt to forget to oil.

SPINDLE NOSE, long taper, key drive. Holds accurate alignment longer. Greater rigidity. Provides a "high price" lathe feature to the medium price lathe users.

For further particulars on these and many other fine features of Clausing Lathes, write:

CLAUSING MANUFACTURING CO.
227 RICHMOND AVENUE **OTTUMWA, IOWA**

CLAUSING MANUFACTURING CO., 227 Richmond Ave., Ottumwa, Iowa
Please send complete literature on the Clausing series 200 lathes
Name .....
Address .....
City .....
State .....

is used right it provides a few minutes to relax off the feet and can extend a man's energy into that last working hour of the day. Many foremen know this is the hour they must be alerted for in keeping the fellow going who begins to lag from leg weariness, etc.

On the other hand, we can't sit at a lathe in screw-thread cutting or many other jobs. So Ed would be o.k. if he required the man to stand on such lines of work, especially the turret lathe.

Lathe hands always have sympathy as they are up against a machine as hard on the back as a kitchen sink. So let's be reasonable and use the stool where it is needed, but let no one abuse the privilege.

Henry Rasmussen
Niagara Falls, N. Y.

•

We make every effort to avoid wear on equipment of all kinds, because it maintains accuracy, cuts friction and saves power. Is it not just as important to use as little manpower as we can whenever and wherever possible to preserve man's energy so he may finish his day's work at a full pace?

Man tires more quickly on a job that offers him no change in his position or actions. A workman who is provided with a stool has an opportunity in many instances to sit and relax for a short period. This breaks the monotony, serves a useful purpose for both the company and himself, and also relieves some unnecessary fatigue. A change of posture, even though it may be of only short duration, is less wearing on the workman.

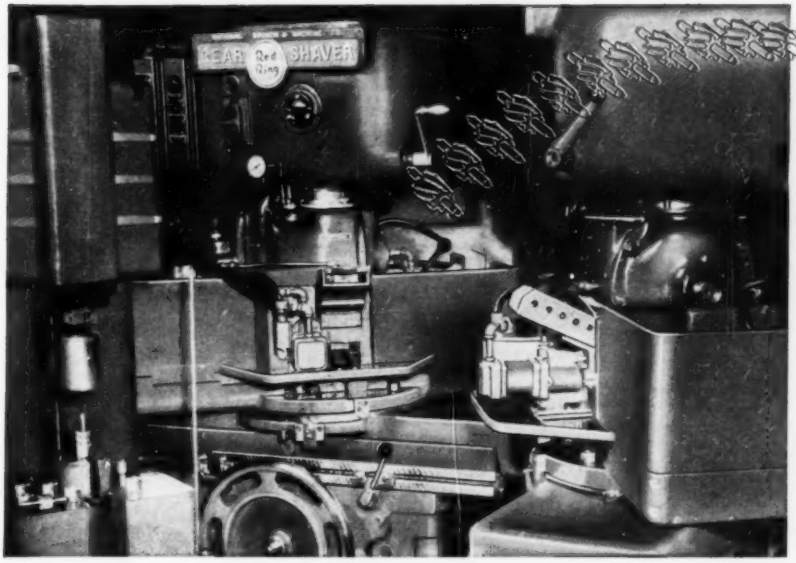
It is difficult to tell in advance just what provision for sitting (when it can be done) is best. However, it is a good investment for any concern to provide special seating to fit the needs of all its employees, so each operator may select the type that best meets his needs on the particular job and machine.

Fatigue will creep in as the day passes, and anything that can be done to ally this is a profitable investment.

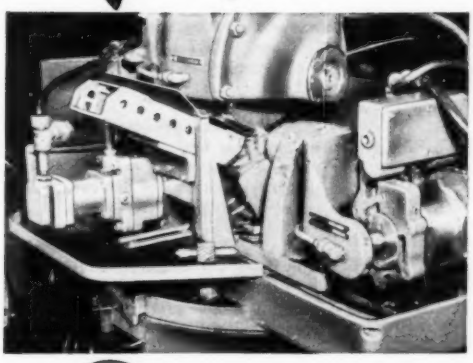
John Mark May
Watervliet, N. Y.

•

On a lathe, as on any other machine, there are times when you can sit down and times when you must stand up. On long jobs or fine cuts, a man will lounge or sit down on something anyway, so he may as well have a stool. He will finish the day less tired than the man who has stood up all the time, and he will



automatic loading *Triples Production* of shaved gears



The installation of Red Ring Gear Shaving Machines equipped with automatic loaders at the Warner Gear Division of Borg-Warner Corporation has practically tripled production of twelve tooth pinions.

These pinions have a 1" face, 13.5 D.P., 20° P.A. and are DIAGONALLY shaved to the Elliptoid tooth form. Tolerance on the involute is held to .0002". An arbor is pressed into each pinion before going into the loader magazine.

The operator merely feeds the pinions into the loader magazine and removes them when ejected from the machine completely shaved. Both loading and shaving are entirely automatic while the machines run continuously.

Red Ring Universal Diagonal Machines shave gears from 1" to 12" pitch diameter by either the conventional or diagonal methods.

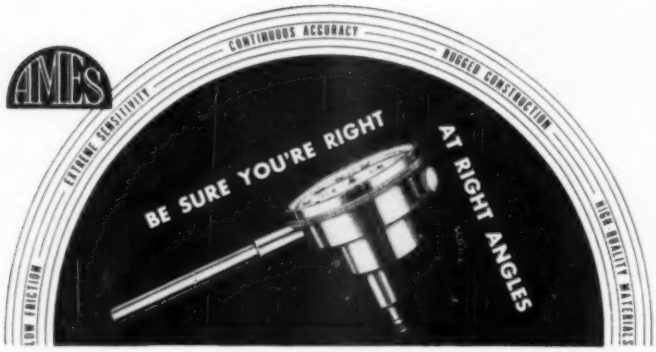
If you are producing precision gears in quantity, ask for descriptive literature on Red Ring Shaving Machines.

5161

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • • • • • • • • • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



Use AMES Horizontal Indicators

The highly accurate, highly sensitive Ames Horizontal is the right indicator for right-angle readings. It is invaluable for tool room and production jobs where it is advantageous to have the dial in a horizontal plane, and on work surfaces where the use of regular indicators is impractical.

The Ames Horizontal is designed with the usual Ames approach of *sustained accuracy through simplicity.* Action is obtained through a rack and pinion—there are no spirals, cams or levers which might introduce wear and incorrect dial readings. Because of its sturdy, forged brass construction, any surface of the case may be used for mounting—or the regularly supplied holding rod may be used.

Be sure you're right at right angles, specify Ames Horizontals. Write for new bulletins describing all sizes and models of this modern gauge.

A Universal or Hole Attachment may be clamped to the stem of the Ames Horizontal. It will check holes, stationary or revolving, up to $1\frac{3}{4}$" deep. This Ames attachment is a favorite for speeding up the performance and accuracy of service and maintenance work.

Address inquiries to Home Office, 26 Ames Street

B. C. AMES CO. *Waltham 54, Mass.*

MANUFACTURER OF MICROMETER DIAL GAUGES AND MICROMETER DIAL INDICATORS
Representatives in principal cities

also produce more and better work.

Ed is wrong when he says a stool is necessary at a drillpress. When drilling a quantity of small holes or many small pieces, it is advisable for the operator to sit, but the man on a big drillpress or a radial drill has neither the time nor the opportunity to sit down. I think the important factor is the length of time involved in the actual cutting operation.

One other factor to be considered is the monotony of the job. If the operator can't relax occasionally at a bench, he will leave his bench.

On the other hand, the opportunity to sit down may be abused. Some men will take it for granted that if a stool is provided they should take it easy. They will do just that and production will suffer unless the foreman is alert. If the question is put to the men, there will immediately be a debate over why some men should have them and some shouldn't, so it's better for the foreman to use his own judgment.

Michael Axler
New York, N. Y.

TO THE EDITOR

How to Work with Contract Shops — Discussion

The article by John S. Denison (page 20, *A.M.*, Nov. 18) struck a responsive chord. I am writing to give the viewpoint of a machine designer, of the fellow in the drafting room who tries to convey to the fellow in the machine shop what he wants and how he wants it by means of a mechanical drawing.

I fully agree that reputation and common honesty in its dealings should be the prime consideration in choosing the contract shop, not price. Try as hard as we may, we designers just cannot get everything on a drawing, and it is sure tough for us when management insists on getting work done at a shop where they take advantage of every loophole to send in a job that is not what it should be just to do it cheaply, resulting in our shop having to go all over it again before we can use it. Sure, we can inspect it and reject it—but that's not getting the job done on time. So we take it, and make the best of it, and the dishonest shop gets away with it.

I fully agree that prints omit much, some much more than others, and I think all drawings should have copious notes on surfaces, holes and dimensions, etc., informing the ma-

POST-WAR PRESS *Sensation!*

Low-Cost ELMES HYDROLAIRS Now Deliver a Continuous Power Stroke

Here's a *welcome improvement* in small hydraulic presses—continuous power stroke that maintains the pressure you select . . . even on *compressible* materials. And when you add to this the many other Hydrolair advantages—small size; light weight; effortless operation, with your regular shop air line furnishing the power—you've *really* got something good.

NO OTHER PRESS LIKE THIS

Hydrolairs have *neither* pumps nor motors. The amazing new Elmes Power-petuator automatically transforms air-line pressure into *positive* hydraulic force. Packless construction assures freedom from maintenance. *Hundreds already in use.*

EASY TO BUY • EASY TO USE

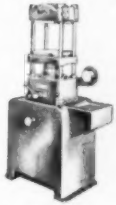
Hydrolairs are as economical *to buy* as they are to use. The 30-ton bench-type sells for only $865.00; the 30-ton floor-type for $1085.00; and the 50-ton floor-type for $1900.00—f.o.b. Chicago. Hot plates and other accessories, extra. Ask for Bulletin 1036A *today.* Elmes Engineering Works of American Steel Foundries, 1001 Fulton St., Chicago 7.

Bench- and Floor-Types
Capacities to 50 Tons

Power-petuator, shown at rear of press, is enclosed in base of floor-types.

30-TON BENCH-TYPE

Opening, 0" to 13". Platen, 10" x 10". Stroke, 6". Dimensions, 30" x 29" x 47" high. Shipping weight, 980 lbs.



30-TON FLOOR-TYPE

Opening, 0" to 13". Platen, 10" x 10". Stroke, 6". Dimensions, 36½" x 19" x 65" high. Shipping Weight, 1325 lbs.

50-TON FLOOR-TYPE

Opening, 14". Platen 18" x 18". Stroke, 6". Dimens. 40" x 27" x 65". Ship. Wt., 2400 lbs. Push-button control, optional.

ENGINEERED BY ELMES
Good Hydraulic Production Equipment Since 1851

Free Folder!

--tells how to finish ZINC OR CADMIUM for better CORROSION RESISTANCE ...PAINT BASE

Eye Appeal

If your product uses zinc or cadmium in any form, find out now about Iridite . . . the chemical dip finish that boosts corrosion resistance . . . provides a paint base that defies peeling, flaking, chipping . . . brightens zinc, keeps it bright and free from stains. Mail coupon today.

Free

Please send me illustrated folder and sample panels of Iridite

NAME_____

COMPANY_____

ADDRESS_____

PRODUCTS_____

ALLIED RESEARCH PRODUCTS, INC.
4004 EAST MONUMENT STREET
BALTIMORE 5, MD.

chinist just how good or how close a part is to be made. Tolerances and limits are fine for production in quantities where parts must be interchangeable, but in a contract shop where perhaps only one machine of a kind or a jog or fixture is being made, a note on the drawing informing the machinist that a fit is to be a "slip fit" or a "running fit" or a "press fit," etc. may save a lot of time and expense in splitting thousandths or perhaps rejecting parts that would be perfectly all right for discharging the function for which they were made if the mating part were made "to suit."

On the subject of holes, particularly, notes may save a lot of time, tell the machinist what the hole is for and what part fits into it and how it should fit instead of tying him up with a lot of ten-thousandth tolerances. It may take a little more time in the drafting room but it will pay for itself many times in the shop. Tell the machinist "press fit for part number so and so" or "running fit for part number so and so" and the machinist will know what he is doing and the designer will get the result he is striving for.

I do not agree that the term "mill" or "grind" is sufficient to inform the machinist what finish a surface should have; a surface might be milled or ground and be extremely rough or smooth as glass. If the designer wants a smooth surface he should note on the drawing that the surface must be "smooth," likewise for "straight," "parallel," etc. It is my belief that the designer should "tell the machinist what to do, but he should not attempt to tell him how to do it." What the designer wants is results; how the machinist accomplishes these results is no concern of the designer.

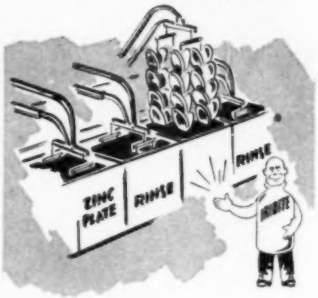
Radii and chamfers should have tolerances unless the requirement is perfectly obvious. A lot of time and money can be spent on the contour of a piece that fits nothing but "a hole in the air."

Every dimension should have some sort of information on it to inform the machinist how close to hold it, a note, a tolerance, etc., unless it is clear how close to hold it without such information.

Pennies spent in the drafting room may save dollars in the shop, and designers should always bear in mind that "drawings are made to convey information, to convey complete information, and not to test the guessing ability of some mechanic."

F. E. Fick
Cleveland, Ohio

Now--a one dip IRIDITE bright finish for AUTOMATIC ZINC PLATING



COMMON CHEMICAL ADDITION ELIMINATES CAUSTIC RINSE—PERMITS AMAZING LOW COST

The one-dip Iridite Bright treatment for standard automatic zinc plating machines has been proved successful and is now being used in production runs.

RESISTS CORROSION—PROTECTS FROM STAIN

This amazingly low cost protective and brightening process produces a shining stain-free surface with good corrosion resistance . . . utilizing only the normal number of tanks after the zinc plating operation: rinse, Iridite, rinse.

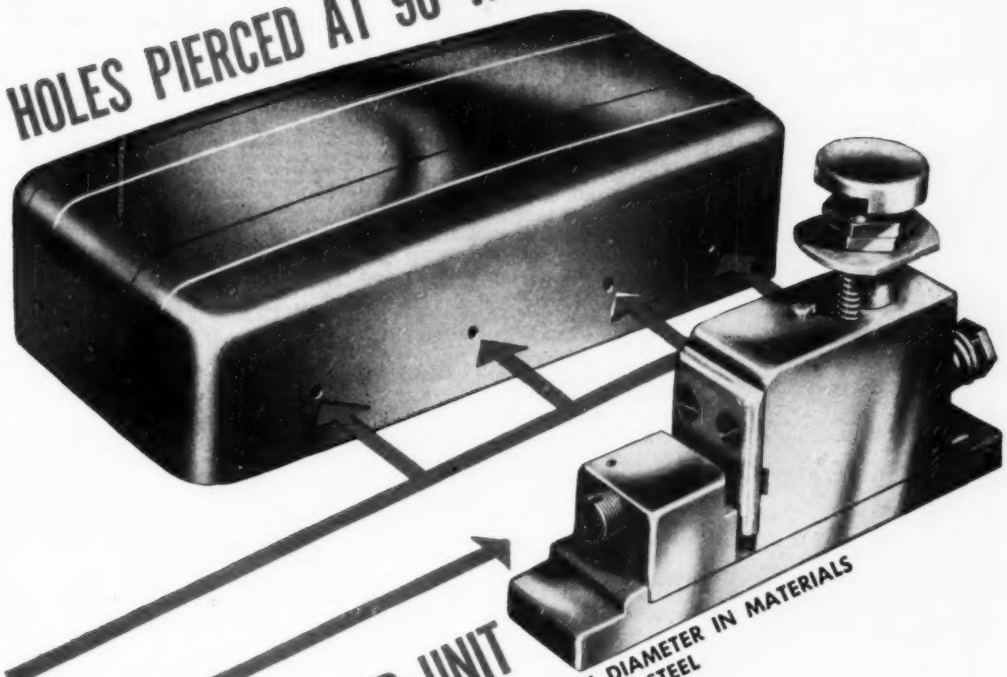
SIMPLE TO OPERATE—NO BLEACHING DIP

This special one-dip Iridite Bright is a non-electrolytic chemical solution . . . operates at 80 to 85° F . . . with no specially trained personnel . . . equally adaptable to bulk plating of parts. Eliminates need for second or bleaching dip.

Whatever your problem in finishing zinc or cadmium — there's an Iridite to do the job. For details, write—wire—or 'phone.

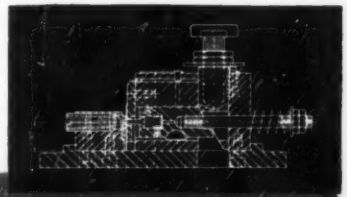
ALLIED RESEARCH PRODUCTS, INC.
4004 EAST MONUMENT STREET
BALTIMORE 5, MD.

HOLES PIERCED AT 90° ANGLE...

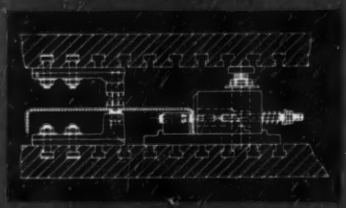


with NEW WHISTLER UNIT

PERFORATES HOLES UP TO ½" IN DIAMETER IN MATERIALS TO 1/16" THICK MILD STEEL



Detailed drawing showing operation of HU-50 90° Perforating Unit.



Typical set-up shows 90° perforating unit operated in conjunction with standard perforating equipment.

DETAILS EXPLAINED IN CATALOG NO. 47

Extruded shapes, ells, angles and other molded, shaped or fabricated pieces are easily pierced from the side at 90° with HU-50 Perforating Units. Quickly set up and adjustable, these units may be used separately or with standard perforating equipment. The advantages provided by other Whistler Adjustable Dies are retained. Absolute accuracy is assured. Quick change-over of hole arrangements can be made ... in many cases, on the press. Production economies and speeded up operating schedules are effected. Continued re-use of units in different groupings spreads initial cost.

It makes sense to look into the use of Whistler Adjustable Dies for all perforating, notching, slitting or rounding operations.

Use the Inside Front Cover for your 90° perforating unit in a hurry. Your copy of this catalog will be sent at once upon request.

S. B. WHISTLER & SONS, INC.

738 MILITARY ROAD BUFFALO 17, NEW YORK

Which blade?
How many teeth per inch?
How many strokes per minute?

These and other questions puzzle many a hack saw user. If they puzzle you, see your Victor distributor. He has the experience and knowledge to show you how to cut metals and plastics faster, easier and better . . . how to choose the right blade for various materials . . . how to get the most from each stroke of the hack saw. Yes, a little advice from the Man Who Knows will save you time and money in the long run.

Ask your distributor for free copies of "Metal Cutting" and the famous Victor Wall Chart containing helpful hints on the selection, care and use of hack saw equipment.

VICTOR SAW WORKS, INC.
MIDDLETOWN, N. Y., U. S. A.

NEW BOOKS

PRACTICAL COLOR SIMPLIFIED—*By William J. Miskella, Published by The Miskella Infra-Red Co., Publishing Div., East 73d & Grand Ave., Cleveland 4, Ohio. 128 pages. Price $5.*

The feature of this book is a color chart for the mechanical selection of harmonizing and contrasting colors. Colors are lacquered on cloth to form the chart and pivoted arrow and triangle aid in selecting combinations.

In addition to instructions for using the chart, the book deals briefly with many aspects of the commercial selection of colors, ranging from signs and products to factory interiors and home decorating.

There is also advice on the mixing of pigments.

•

DESIGNING FOR ALCOA DIE CASTINGS—*Published by Aluminum Co. of America, Pittsburgh, Pa. 188 pages. Price $1.*

Covering both aluminum and magnesium, this books gives a complete picture of the die castings made from these light alloys including the choice of alloys, machines and dies, machining, finishing, and inspection.

Much of the book is devoted to recommended practice on design details. Intended to prepare for and simplify engineering conferences, as well as to minimize the need for them, the book is an up-to-date compilation of practice that has been developed in recent years.

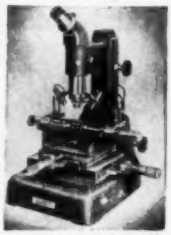
The book should be of value to both buyers and designers in making effective, economical use of aluminum and magnesuim die castings.

Furnace Assembly

FURNACE-BRAZED assemblies of stampings are being used extensively in the jet program . . . Applications are expected in larger internal combustion engines than the Crosley . . . Stamping companies bemoan their usual failure to identify their products. In one recent case, a customer, with a sample bracket for a radio speaker, asked if a particular company could make that bracket. The customer didn't know it, but the company they had selected makes most such brackets—had in fact made the unmarked sample.

SCHERR *aids to precision – production*

Low-Priced and Practical Toolmakers Microscope—The WILDER



Here it is at last—a precision checking tool that every shop needs, at a price that any shop can afford. Measures two ways with micrometer to .0005, or with gage blocks for closer accuracy. The image is on a clear glass reticule for maximum definition. Has understage lighting for shadow image, and surface lighting for reflected image. An essential instrument in today's precision demands, at a most interesting price. Write.

Gears have no secrets from the PARKSON GEAR TESTER *Tests gears in mesh*

Locates distance, center to center, at which gears run best. Measures backlash, reveals any pitch line eccentricity, thick teeth, spacing errors, off-center teeth, burrs. Registers deviation on dial indicator in .0005". With autograph Recording device (for spurs and helicals only) makes permanent records on waxed discs, which can be kept for reference on gear quality. Capacity, 9" between centers. Other models to 36". For all types of gears. A valuable trouble-saving tool, widely used wherever gears are made.

Get low-cost precision with Ultra-Chex Gage-Blocks

The last word in modern basic accuracy brought within the grasp of all shops large and small. Sets in size for all budgets. All blocks accurate to five millionths. Illustrated is the 34-block set, giving 80,000 combinations in steps of 1/10,000", with optical flat for checking wear. Low prices allow for constant practical shop use in setting tools, checking gages, locating holes in jigs and fixtures, etc. Many shops use a number of sets, with one master set for reference. Set shown, $125.

There's enduring accuracy in SCHERR DIAL INDICATORS

Last longer and cost less. Have an exclusive mechanism of extra sturdiness, with only three moving parts. No quick spinning wheels or unhardened racks. Furnished with standard back or with ball-joint back for setting at any angle. Contact points for all needs. With clamp holder, extension bar, tool-post holder, in compact metal case. Indicator Only $10. Complete set with universal attachments, $19.75. *Write for full details on these tools*

GEO. SCHERR CO., Inc.
200-D Lafayette St. New York 12, N.Y.

Used by

BULOVA • DU PONT • EASTMAN KODAK
R. H. FREITAG • GENERAL TIRE & RUBBER
GIDDINGS & LEWIS • GISHOLT • I. B. M.
INGERSOLL-RAND • LAMINA DIES & TOOLS
LANDIS TOOL • MALL TOOL • W. H. NICHOLS
PORTAGE MACHINE • and many others

for High Precision

SIP

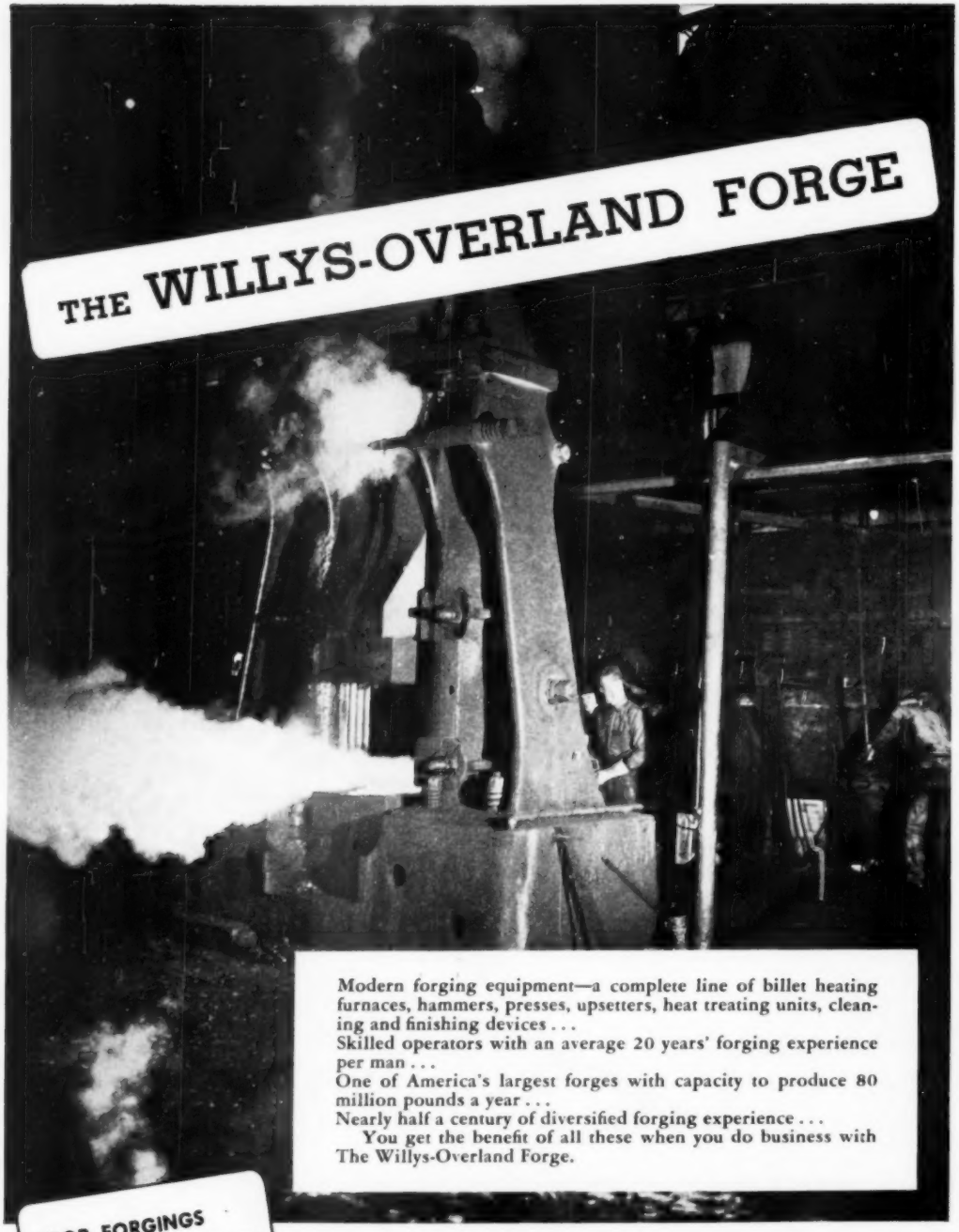
HYDROPTIC—B

The accuracy of many of the nation's most widely used products depends on the precision results obtained on SIP Hydraptic-B Jig Boring and Milling Machines. The built-in optical measuring system of the Hydroptic-B guarantees accuracy for all settings of 0.0002", making it a reliable basis of accuracy for all shop machining and measuring. Write for mechanical specifications and performance data.

COSA

COSA CORPORATION

624 CHRYSLER BUILDING, NEW YORK 17, N. Y.



Modern forging equipment—a complete line of billet heating furnaces, hammers, presses, upsetters, heat treating units, cleaning and finishing devices . . .
Skilled operators with an average 20 years' forging experience per man . . .
One of America's largest forges with capacity to produce 80 million pounds a year . . .
Nearly half a century of diversified forging experience . . .
You get the benefit of all these when you do business with The Willys-Overland Forge.

DROP FORGINGS
HOT PRESS FORGINGS
UPSET FORGINGS

For complete information, write, wire or telephone

THE WILLYS-OVERLAND FORGE

WILLYS-OVERLAND MOTORS, INC., TOLEDO 1, OHIO

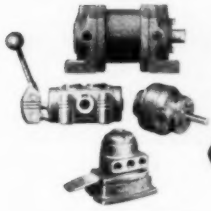
3 essentials

GEROTOR offers to help you apply the correct air and hydraulic devices to your equipment!

1

Engineer-Distributors at Your Service

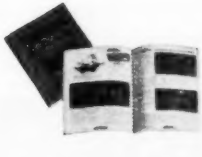
Gerotor service is featured by the engineering assistance of its factory trained distributors. These men are qualified from long experience to handle any air and hydraulic problem. Located in all principal cities, they can assist in laying out the circuit best suited to your operating requirements and recommend the correct equipment to provide long years of satisfactory operation.



2

The Complete GEROTOR Line

Gerotor can furnish the exact model valve, cylinder and pump to meet individual requirements. For example—Gerotor 4-Way Hydraulic Valves are offered in 50 models with 4 types of action—standard, spring return, spring centered and ball detent; 5 piston designs; 6 types of operation—hand, foot, cam, solenoid, oil and air pressures; 7 sizes—$\frac{1}{4}$", $\frac{3}{8}$", $\frac{1}{2}$", $\frac{3}{4}$", 1", $1\frac{1}{4}$" and $1\frac{1}{2}$".



3

Informative Literature

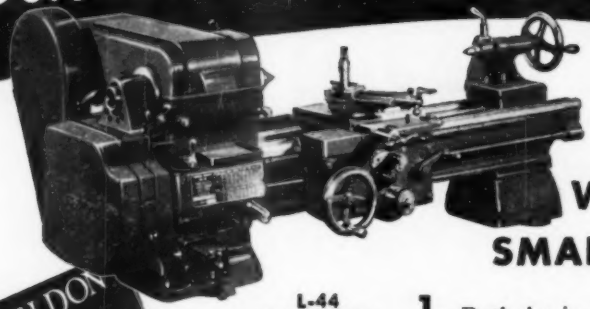
The 100-page Gerotor Catalog describes every detail of hydraulic and air valves, cylinders, pumps, pump units. It represents the most thorough presentation of hydraulic and air devices that long experience in this field can prepare. If you do not have the new Gerotor Catalog in your file for reference and assistance, write for your copy today.

GEROTOR MAY CORPORATION
Dept. AM-1, Baltimore 3, Maryland

WHEN YOU APPLY HYDRAULIC OR AIR POWER *Plan with*

GEROTOR

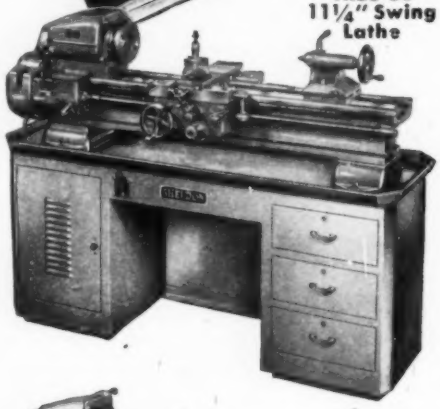
Look for these new Features...

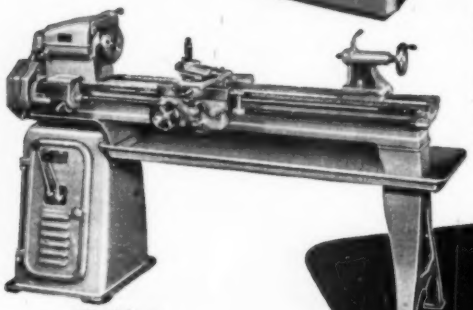


WHEN BUYING SMALL LATHES

L-44
10⅛" Swing
Lathe

Sheldon
TRBS-56
11¼" Swing
Lathe





Sheldon
TU-1248P
13⅛" Swing
Lathe

1. Both basic (a) and operating (b) accuracy of the bed—(a) Ways held to a tolerance of .0005" for the full length of the bed for parallel alignment. (b) Engineered distribution of mass to give extreme rigidity without excessive bulk.

2. Timken Precision Taper Roller Bearings — for regular operating speed and permanent accuracy.

3. Increased Collet Capacity.

4. Greater Swing for size.

5. Greater Power at tool point.

6. V-Belt Motor Drive with increased speed range.

7. Lower prices—far more tool for the money resulting from modern manufacturing methods, in a specially built plant that is "tooled to the teeth" with the finest machine tool building equipment.

Write for the New G-48 Catalogue of Sheldon Lathes and check each for these 7 important features.

SHELDON MACHINE CO. Inc
Manufacturers of Sheldon Precision Lathes • Milling Machines • Chucks
4336 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U.S.A.

Quick pay-off - - 2 case histories

Automatic drilling and tapping machines pay for themselves in 1 to 3 years by cutting costs of high production parts to pennies.

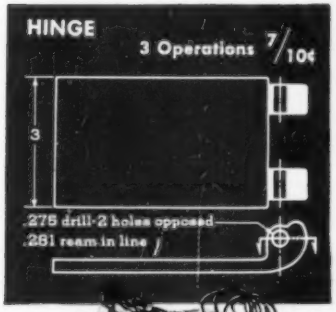
Dear Sir:

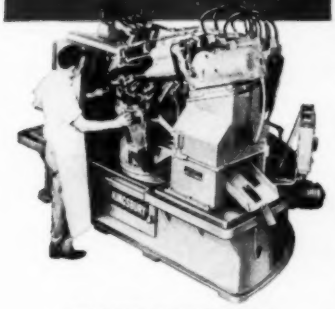
These 2 machines save money. That is the only reason for their existence.

They will pay for themselves in 1 to 3 years. Their owners, like all our customers, are impatient to get their investment back. If a Kingsbury's pay-off period ran over 3 years, they would keep on using their old equipment.

How automatic machines cut costs

Operations are in accurate location. (Bushings guide drills and reamers. One chucking instead of several.)





750 PARTS AN HOUR GROSS

While the man drops 3 hinges into nests, the machine clamps and drills 3 parts, reams 3 parts and ejects 3 parts down the chute. Then he presses a lever and the table indexes.

- 2 units drill from opposite ends at the left station. One unit reaches across the index table to drill from the rear.
- The rear unit reams both pin holes with a 6-inch stroke.
- Air cylinders operate levers to clamp the work automatically.
- All units have 3-spindle auxiliary heads to work on 3 parts at once.
- The machine can operate on similar hinges.
- Bushings guide the drills.
- An interlock prevents the table from indexing until every tool is withdrawn.

Parts are uniform. (Automatic cycles do not vary. Fixtures are identical duplicates.)

Saves floor space. Reduces handling.

But the real big reason is this: More output per man-hour. The operator chucks the work. The machine finishes the job. You can say this about a Kingsbury: Cost is low when production is high.

Sad to say, the opposite is also true. Cost is high when production is low. If you have a tough problem with accuracy or uniformity, a Kingsbury may *still* be a good investment. But if your production runs are short and you do not worry about accuracy, you might just as well turn the page.

Kingsburys do many different jobs

Jobs can be simple or complex — operations few or many, from one direction or several, simultaneous or successive. Holes can be from the smallest up to 1 inch (5 hp).

To find the most efficient setup for each job, we select from a complete line of standard equipment. Just look: 12 automatic drilling and tapping units with 82 standard attachments; 8 standard units and 18 standard bases. There are 4 basic types of indexing machines and 2 types that do not index.

What standard units do

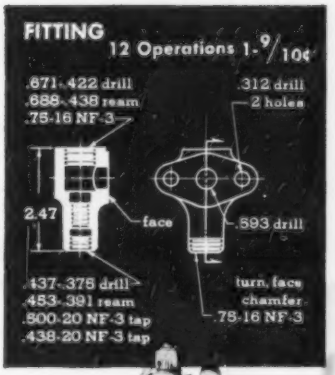
Kingsbury units drill, tap, counterbore, hollow mill, thread, spot face, ream, etc. Attachments mill light cuts in the same chucking with these operations. Multi-spindle auxiliary heads perform similar operations of about the same speed and feed.

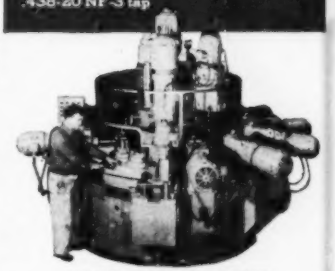
How about sending us a print?

Let's get down to cases. Let us tell you exactly what a Kingsbury can do for you. Send us a print of a high production part and identify the operations and tell us the hourly output you need. If it is complicated, we'd like a sample part too. Our sales manager says it makes the job easier to visualize, but there is more to it than that. He leaves it on his desk; the general manager spies it; a sales engineer joins them. When the argument gets noisy we know they are working out something. You'd be surprised at the ideas they dream up that way. Some of them are darned ingenious.

Sincerely yours,
Kingsbury Machine Tool Corp.
70 Laurel St., Keene, N. H.

P.S. Here is the basis for costs in the case studies. 80% efficiency. Machine paid for after only 6000 hours, a fraction of its expected run. Wage rate above national average. No power or overhead included.





605 PARTS AN HOUR GROSS

When the table indexes, every chuck rotates 180°. Horizontal units can then work on opposite ends of the fitting. While the man chang 3 parts at the loading station, 4 vertical and 8 horizontal units operate on the parts at 11 working stations.

- A power wrench rotates a screw on each chuck to open and close it quickly.
- 12 self-centering two-jaw chucks are exact duplicates.
- Control is all-electric and meets Automotive Electrical Standards. Control devices are in a separate sheet metal cabinet away from the machine (not shown).
- A plexiglas splash guard hangs from the ceiling. The man lifts it to reach the tools.
- Bushing plates pilot onto locators on the chucks to align the tools.
- The column for the 4 vertical units is in the center so all tools are in easy reach. The working area is not caged in.
- Indexing can be automatic or under the control of the operator. He can jog the table part way for setting up or changing tools. 84

KINGSBURY

AUTOMATIC DRILLING
AND TAPPING MACHINES
for Low-Cost High Production

COMMON SENSE ASSEMBLY ENGINEERING

Puts Fastening Costs in a Better Light

MAKES PARKER-KALON TYPE Z SERVE DUAL PURPOSE . . . SAVES 35%

To make the price of these adjustable fixtures as practical as the lamp itself, the manufacturer—**Penetray Corp., Toledo, Ohio**—had to "go light" on fastening costs. That meant fast assembly with as few operations as possible.

But the fasteners had to serve a dual purpose . . . attach the plastic Hemisphere socket to the fixture's metal base (or gooseneck) and function as pivots to permit a 180° sweep of the socket.

P-K Self-tapping Screws were selected because they not only eliminated troublesome tapping and tap breakage, but also provided the hardened tips of the screws to serve as long-wearing pivots. Thus, they permitted a simpler, smoother design, and helped brighten the cost picture with a 35% assembly saving!

Why not examine your own fastening methods in the light of common sense assembly engineering. Very likely you, too, can benefit by switching to the simpler Parker-Kalon method. Call in a P-K Assembly Engineer. He can show you that in 7 out of 10 cases, use of P-K Self-tapping Screws saves up to 50% in assembly work hours. If you prefer, mail assembly details for recommendations. Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

Sold Only Through Accredited Distributors

Two P-K Countersunk Oval Head Type "Z" Self-tapping Screws fasten plastic socket to metal base of fixture and also serve as pivots for Hemisphere socket which moves 180° in a vertical plane. P-K Screws need only to be driven in plain holes . . . form their own threads . . . assure a strong fastening.

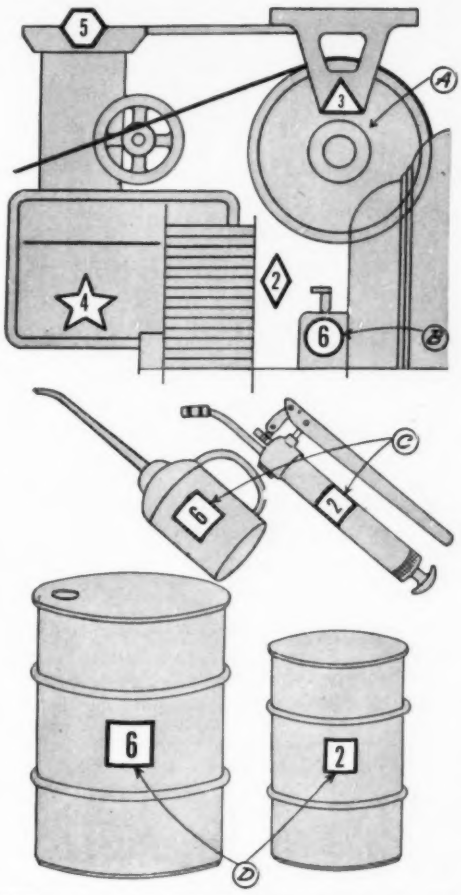
P-K® *The Original*

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY

PARKER-KALON SELF-TAPPING SCREWS

PARKER-KALON PRODUCTS COLD-FORGED SOCKET SCREWS, WING NUTS, THUMB SCREWS • HARDENED SCREWNAILS AND MASONRY NAILS SHUR-GRIP FILE AND SOLDER IRON HANDLES • METAL PUNCHES • DAMPER REGULATORS AND ACCESSORIES

Case 1102--Preventing Lubrication Mistakes in Plants and Motor Fleets



Many operators of plants and fleets in the West have practically eliminated operation delays due to improper lubrication or use of wrong lubricants, by installing Standard of California's free, coded system of planned lubrication. The system employs symbols instead of colors to indicate lubrication intervals -- stops mistakes caused by color-blindness, faded colors or changed appearance of color in different lights. Available for plants and fleets in the Seven Western States.

A. Black-on-white decalc symbols show desired lubrication intervals at a glance. Are placed directly on machine at lubrication points.

B. Numbers on the decalcs indicate the kind and grade lubricant to be used at each point. Chart card on each machine gives meanings of symbols and numbers.

C. Lubricant number-decalcs on dispensers identify lubricant in each dispenser and prevent its use in wrong place.

D. Lubricant number-decalcs on barrels, cans or other storage show kinds and grades of lubricant in stock.

All decalcs, chart cards and other material for the Standard Coded System of planned lubrication, and installation of the system are free. On request, a Standard Fuel and Lubricant Engineer from Standard Technical Service will survey your plant or other operation any place in the Seven Western States. He will make recommendations, give expert advice and install the Standard Coded System if you desire it.

Trademarks, "Calol," "RPM," Reg. U. S. Pat. Off.

STANDARD TECHNICAL SERVICE will make your maintenance job easier. If you have a lubrication or fuel problem, your Standard Fuel and Lubricant Engineer or Representative will gladly give you expert help; or write Standard of California, 225 Bush Street, San Francisco 20, California.

RPM CALOL

FOR EVERY NEED A **STANDARD OF CALIFORNIA** JOB-PROVED PRODUCT

REDUCEROLL YOUR FORGING BLANKS!

Illustrated above at the right is a typical example of a forging blank pre-formed on National's new REDUCEROLL.

The stock shown at the left is REDUCE-ROLLED in two rolling passes preparatory to impression die forging on the same heat.

REDUCEROLLING gives you these advantages:

1. Increased production.
2. Unskilled operation.
3. Accurate distribution of stock.
4. Increased die life.
5. Freedom from shuts and folds.
6. Versatility—increases the usefulness of your forging equipment.
7. Ruggedness—for large reductions in area.
8. Portability—for use as a "roving" tool.

Let us help you investigate the application of REDUCEROLLING to your forging jobs.

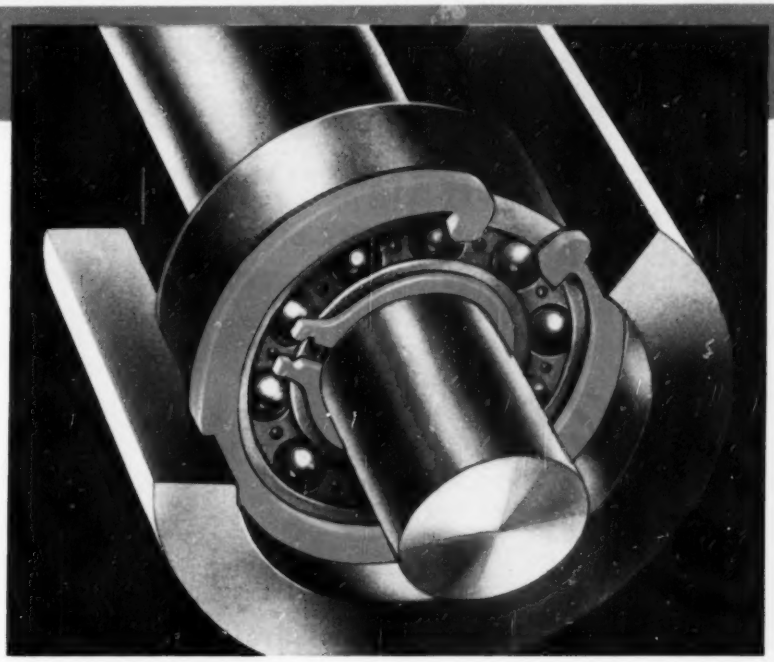
75th Anniversary 1874-1949

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

New York Detroit Chicago

•Save Time •Save Materials •Save Money!



Examine the designs of **all** your products and machines. No doubt you can use retaining rings on axles and in housings – not **only to save assembly time, but to save weight, parts and space.**

The use of these inexpensive yet efficient artificial shoulders is already widespread, and is increasing daily.

There are literally thousands of places in which redesigning for retaining rings can increase your profits and improve your product – uses ranging from heavy duty engines and drill presses to toys, gadgets and small parts of innumerable articles.

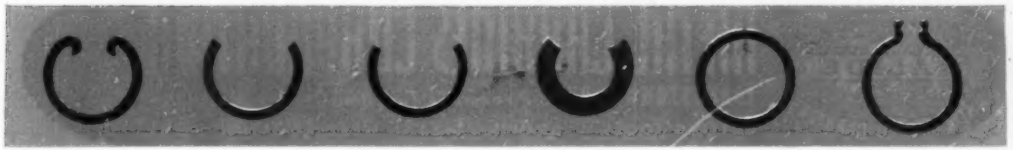
It's wasteful to cut down shafts to make shoulders. Redesign to groove smaller shafts and housings and use these high grade steel rings.

Let our engineers consult with you. Send for folders.

Don't pass up this opportunity to increase profits.

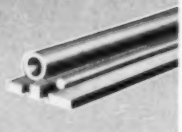
THE NATIONAL LOCK WASHER CO.

NEWARK 5, NEW JERSEY • MILWAUKEE 2, WISCONSIN



Talide
(TUNGSTEN CARBIDE)
Cutting Tools

TALIDE METAL MEETS EVERY REQUIREMENT



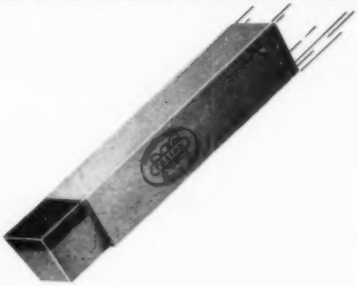
SOLID BAR STOCK

DRAWING DIES

CENTERLESS BLADES

DRILL JIG BUSHINGS

ROLLING MILL WORK ROLLS



2 to 3 TIMES FASTER!

Call our service engineers for assistance on tooling problems

Faster cutting than other tools, Talide Tools and Tips wear much longer and require only infrequent redressings. Same long-run advantages whether you machine steel, cast iron, non-ferrous metal or non-metallic materials.

The quality of Talide Tools never varies. Made from the hardest man-made metal, each Talide Tool and Tip has the same metallurgical consistency.

For lower costs, try Talide Tools and Tips . . . plastic-dipped for protection in shipment or storage. Available in 24 hours or less from warehouses in Newark, Youngstown, Detroit and Chicago.

Send for engineering-style catalog 48-T "Standard Talide Tools and Tips"

SINTERED CARBIDES
METAL CARBIDES CORPORATION
MC TALIDE
YOUNGSTOWN, OHIO
HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

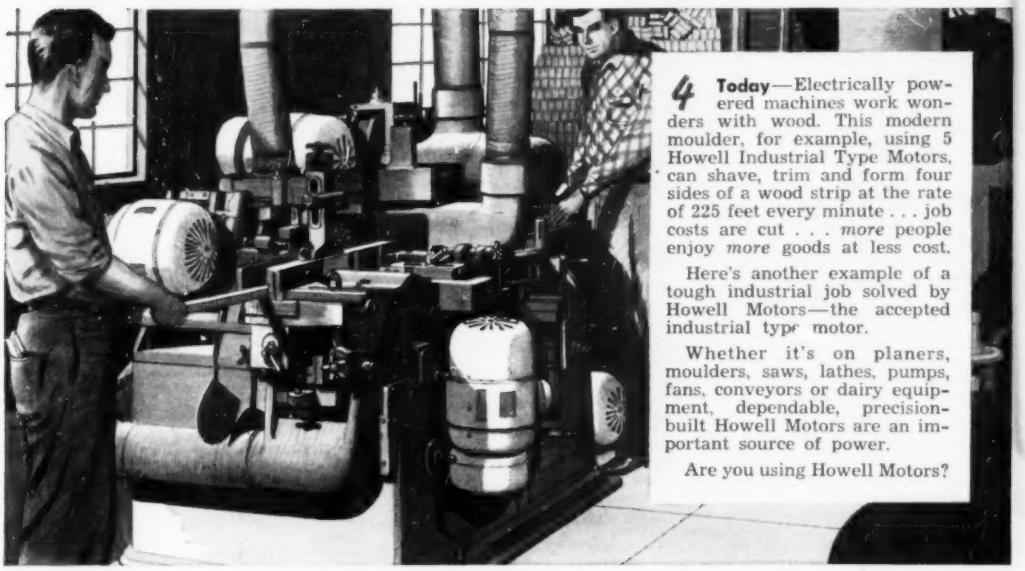
1 **1760**—A strong back, sharp axe and plenty of time and patience were a *must* for the frontier homebuilder. He cleared the land, felled his trees, hewed logs to fit and hoped his house wouldn't leak when he finished.

2 **1875**—Lumber, the universal building material, was a budding industry. But woodworking machinery was hard pressed to keep pace with the tremendous demand. Urgently needed was low cost electrical power to boost output.

3 **1915**—Howell "Red Band" Electric Motors appeared. Applied to machines in woodworking and other important industries, these rugged, industrial type motors soon won wide recognition for making good on tough jobs.

WORKING WONDERS WITH WOOD

(Up to 225 Feet Per Minute)



4 **Today**—Electrically powered machines work wonders with wood. This modern moulder, for example, using 5 Howell Industrial Type Motors, can shave, trim and form four sides of a wood strip at the rate of 225 feet every minute . . . job costs are cut . . . *more* people enjoy *more* goods at less cost.

Here's another example of a tough industrial job solved by Howell Motors—the accepted industrial type motor.

Whether it's on planers, moulders, saws, lathes, pumps, fans, conveyors or dairy equipment, dependable, precision-built Howell Motors are an important source of power.

Are you using Howell Motors?

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

Here's another precision-built Howell Motor . . . industrial type with copper or bronze bar rotors . . . specially insulated . . . statically and dynamically balanced.

Howell Protected Type Motor

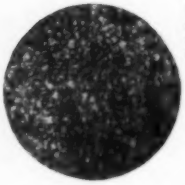
HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Manufacturers of Quality Industrial Type Motors Since 1915

Controlled Adsorption

You get this advantage with PARCO CLEANERS



Left: Bonderite coating on metal, after cleaning with Parco Cleaner. Magnification 100x. Note fine, dense, uniform Bonderite coating.

Right: Bonderite coating on metal, after ordinary cleaning. Magnification 100x. Note extreme lack of uniformity in Bonderite coating.

A good cleaner does more than remove soil from metal surfaces. It prepares the metal for the next step in the finishing operation, whether it is Bonderizing, painting, plating or further fabrication.

Cleaning compounds are adsorbed on the surface of the metal during the cleaning operation. Research has established that the degree of adsorption contributes to the success or failure of subsequent finishing operations. The key to successful metal cleaning is *controlled* adsorption.

Over twenty-five years' experience in the field of metal preparation has led to the development of Parco Cleaners with built-in Adsorption Control. These cleaners will help you obtain better results with fewer rejects in your metal finishing department.

Give Parco Cleaners a trial and see what a difference Controlled Adsorption makes in cleaning your metal.

The combination of Parker Research and experience that developed Parco alkali and emulsion cleaners with built-in Adsorption Control also produced Parco acid cleaners with outstanding rust and grease removing properties.

Bonderite, Parco, Parco Lubrite — Reg. U. S. Pat. Off.

Parker RUST PROOF COMPANY

BONDERIZING • PARKERIZING • PARCO LUBRIZING

2196 E. MILWAUKEE AVE. • DETROIT 11, MICHIGAN

Improper tightening of screws, nuts, and threaded parts, accounts for many of the "bugs" that develop in mechanisms . . . causes binding, breakage, chatter, thread stripping, leakage, squeaks and loosening and loss of parts.

These mechanical faults can be eliminated with a resultant improvement in product quality by torquing all critical points with STURTEVANT TORQUE Wrenches. Inherently and permanently accurate, STURTEVANT TORQUE WRENCHES are as easy to use as an ordinary socket wrench, and are extremely fast on the production line.

Write for Bulletin SW5

P. A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

Convert TO HIGH SPEED STEEL and SENTRY HARDENING

Why?

Increased production and longer tool life result from converting to H. S. S. Tools. These tools give even better performance when full hardened the Sentry way. Sentry Electric Furnaces utilize the Sentry Diamond Block method of obtaining a controlled neutral atmosphere for long soaking without carburization, decarburization, scaling or shrinkage. Intricate form cutters are held true to shape. No grinding necessary after hardening.

Here's Proof!

A Sentry Furnace user comes up with these interesting figures. The tests were made on cutters, drills and punches.

Former Steel Used	H. S. Steel Sentry Hardened
400 Parts per Cutter	2600 Parts per Cutter
350 Holes per Drill	3350 Holes per Drill
1200 Parts per Punch	14300 Parts per Punch

Many other Sentry users have equally convincing production figures. Get the facts about Sentry Furnaces and Sentry Diamond Blocks.

Sentry Furnaces pay for themselves in a short time through better quality hardening for longer lasting tools. Write for full information.

ASK FOR BULLETIN 1054-F12

The Sentry Company
FOXBORO, MASS., U.S.A.

KHP

Precision SPRING STEEL

KHP *precision* Spring Steels are available in both annealed and tempered grades, in a carbon range of .50 to 1.00. Choice of finishes in blue, straw, and mirror bright. Thicknesses from .0015 to .125 in tempered, and from .005 to .1875 in annealed. Also Feeler Gauge steels in all thicknesses. To assist you in the most economical application of KHP Spring Steels, the cooperation of our metallurgical department is freely at your service.

KHP PRODUCTS ARE: Cold rolled and hot rolled strip—shim—sheet steels • Annealed spring steels • Tempered and polished spring steels • Tempered feeler gauge steel • Cold finished bars • Drill rod • Electrical sheets • Precision tubing—cold drawn seamless—welded—stainless and alloy tubing • Aluminum strip and sheets • Extruded aluminum and magnesium tubing—shapes—mouldings • Rolled magnesium plates • KHP SERVICES: Edge rolling • Slitting • Square shearing • Flattening, straightening, cutting.

KHP STEEL

KORHUMEL • HEFFRON & PREISS STEEL CO.

2426 Oakton Street • Evanston, Illinois • AMbassador 2-6700
Rockford Phone Enterprise 1266 • Teletype Evanston 1675

WAREHOUSES: MINNEAPOLIS • MILWAUKEE • MT. VERNON, N.Y. • SALES OFFICES: DETROIT • ST. LOUIS • LOS ANGELES

Again NEW, LOWER PRICES FOR LEMPCO ANTI-FRICTION DIE SETS

This third recent major price reduction is a prompt reflection of lower manufacturing costs.

Your enthusiastic acceptance of Lempco Anti-Friction Die Sets has allowed us to step-up production schedules and add more time-saving machine tools. We've been able to cut costs on our latest model—and, in the American tradition, pass our savings along to you.

The new Lempco *Precision* Die Set gives you all the advantages of anti-friction construction: increased die life . . . faster, more accurate production . . . greater economy.

Write today for your new price list and specifications for Lempco *Precision* and *Super-Precision* Anti-Friction Die Sets. At their new, lower prices, Lempco Precision Anti-Friction Die Sets are more than ever the best value your dollar can buy.

Preloaded anti-friction bearings between leader pins and bushings hold punches and dies in perfect alignment. And, they allow sets to open and close freely and easily . . . save assembly and try-out time . . . cut costly downtime.

LEMPCO

5711 DUNHAM ROAD • BEDFORD, OHIO

Licensed under the inventions of Guy Connor.

THIS COMPANY is recognized the world over for its leadership in the field of hardness testing. It started by developing, and followed during the past 27 years by continuously improving, the important and famous "ROCKWELL" Hardness Tester. Recently we have developed additional hardness testers and accessories successfully meeting the expanding requirements of modern industry. Our research, production, standardizing and our factory and field engineering groups, through their skill and long experience, backed by this company's sound financial ability, are now carrying into the future our great tradition of progress and leadership in the field of hardness testing which we know so well.

WILSON

MECHANICAL INSTRUMENT CO., INC.

AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

ACCO

230-B PARK AVENUE, NEW YORK 17, N. Y.

SURE CURE FOR PUMP HEADACHES

Forget pump worries. Tuthill small pumps are recognized the world over for their dependability in lubrication, coolant, hydraulic and liquid transfer service. These internal-gear type rotary pumps are available in capacities up to 200 g.p.m. and pressures up to 400 p.s.i. Wide choice of porting and mounting arrangements in both packed and mechanically sealed pumps. Write for General Catalog.

TUTHILL PUMP COMPANY

939 East 95th Street, Chicago 19, Illinois

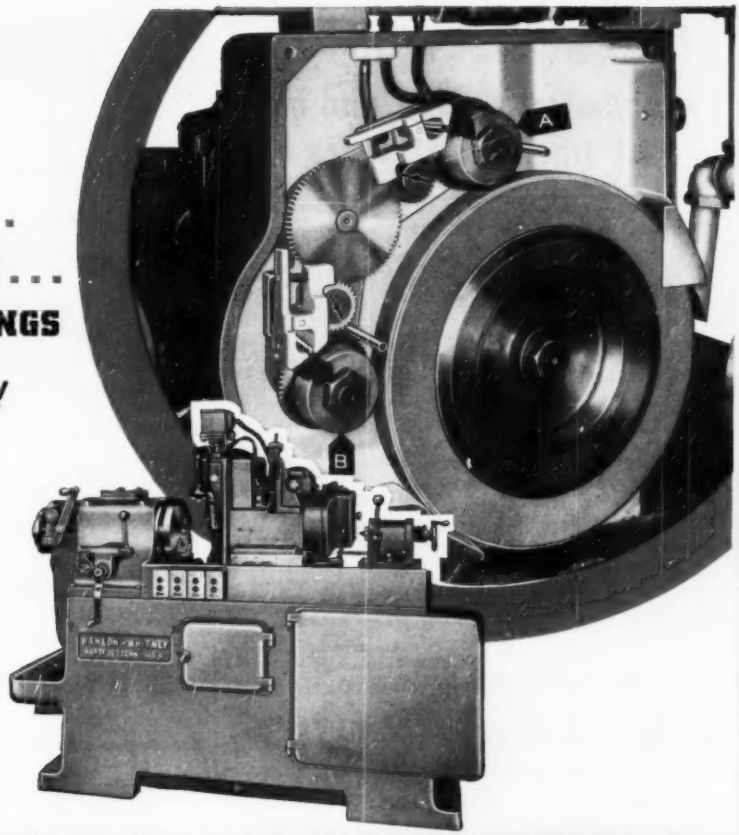
EASIER...

FASTER...

MORE...

WHEEL DRESSINGS

at lower cost!



A FEATURE

OF THE

HANSON-WHITNEY THREAD GRINDER

This page has been arranged for but one purpose . . . to induce you to *see* the new Hanson-Whitney semi-automatic Thread Grinder at work. It is impossible, in restricted space, to explain the importance of this engineering achievement . . . to provide the close-up photographs that bring out the many design innovations . . . nor can we show you the accuracy, the speed, the quality of production.

But we *can* arrange an appointment that we believe will interest anyone who needs a better, faster, method for grinding external threads from the solid on a production basis.

You will see a Master Roll (A) that re-trues the Grinding Wheel for re-grinding the Crusher Roll (B) in position, whenever its pattern has been worn by repeated crushing of the wheel. This means uninterrupted production for a long time . . . until the original Master Roll thread pattern itself becomes worn.

This is but one valuable feature of this machine. If the 2" (long) threading capacity... produced in 1-1/6 revolutions of the work... meets your needs, we ask you to write us.

CATALOG AND PRICES ON REQUEST.

HANSON-WHITNEY MACHINE CO., HARTFORD 2, CONN.
Division of Whitney-Hanson Industries, Inc.

Hanson Whitney

PIONEERS OF FINISHED TAPS

THW49

Save time and labor with these sound practices in

Economical design and use of *Jigs and Fixtures*

YOU can get the better of jig and fixture design problems with the aid of this time-tested shop manual. It's been completely revised and rearranged to bring it in line with present day practice . . . it contains everything the tool designer, tool engineer and tool maker needs for effective and economical jig and fixture design. This practical book tells you what it pays to know about time-saving methods of using jigs and fixtures . . . gives you priceless design suggestions, construction hints, and cost data with which to solve specific shop problems . . .

Effective Drafting-Room Practice

You'll find valuable hints on modern drafting room procedures, record keeping systems, tool costs and related subjects such as machine vises and clamping methods. Drawings of over 600 different pieces, many as used in large manufacturing companies, are included.

Consult the big 5th edition for:

- New standards for jig bushings
- Up-to-date information for designing clamps and spherical washers to improve designs and lower costs
- New fixtures for aircraft assembly, automobile connecting rods, for welding parts in manufacture, for use in railroad shops.

New 5th Edition — Just Out!

JIGS AND FIXTURES

By FRED H. COLVIN

Editor Emeritus, American Machinist and LUCIAN L. HAAS

375 pages, 6 x 9, over 600 illus., $4.50

Complete coverage of

- tool-design standards
- drill-jig bushings
- machine vises and vise jaws
- clamps and clamping methods
- types of drill jigs and fixtures
- details for fixture design
- tool room systems

IN easy-to-understand fashion, the book shows just when it pays to make jigs and fixtures, compares cost of cast and welded jigs, and suggests best uses for each. Examples of light weight jigs of aluminum and magnesium are given.

Brings you time and labor-saving methods

Each item that enters into the proper design of jigs and fixtures is considered . . . arrangement of views, lines and linework, dimensioning, screw-thread representation for bolts and threaded parts, etc. Examine this book for a complete guide for producing efficient and economical work-holding devices.

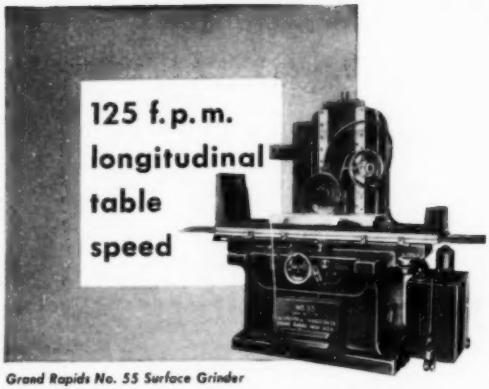
SEND NO MONEY
SEE THIS BOOK
10 DAYS
FREE

McGRAW-HILL BOOK CO., INC.
330 W. 42nd STREET, N. Y. C. 18

Send me Colvin and Haas' JIGS AND FIXTURES for 10 days' examination on approval. In 10 days I will send $4.50, plus few cents postage, or return book postpaid.*

Name .....
Address .....
City ..... Zone ..... State .....
Company .....
Position A-I-11-48

*SAVE! We pay mailing costs if you send cash with order. Same return privilege.



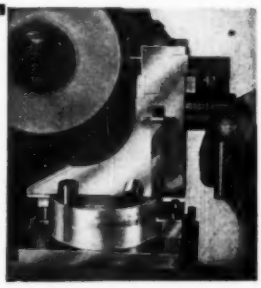
Grand Rapids No. 55 Surface Grinder

Faster precision production is possible with the exceptional table speed of Grand Rapids Hydraulic Feed Surface Grinders. Both longitudinal table travel and cross feed are automatic, hydraulic. Wheel head is powered for rapid vertical travel.

Write for Bulletin GL-101

GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
330 STRAIGHT ST., S.W., GRAND RAPIDS 4, MICH.

WHERE TIME IS MONEY



use *Fluidmotion* * WHEEL DRESSERS

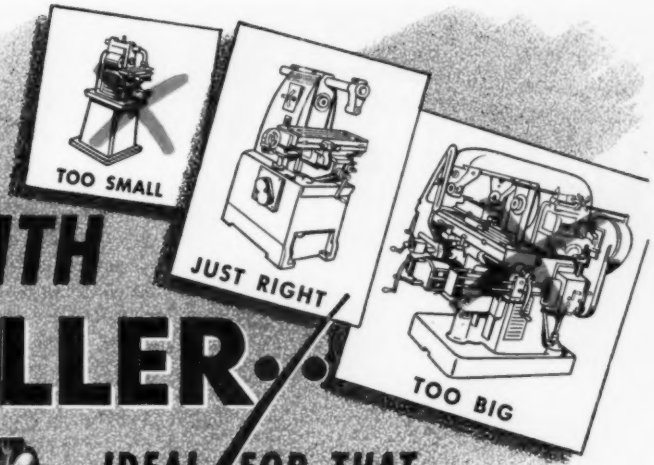
QUICK set-up and operation, with remarkable accuracy, make Fluidmotion Radii and Angle Dressers the finest precision instruments of their type obtainable. Two angles and a radius can be dressed in one continuous motion, after only one setting. Angles and radii flow into each other, without sharp change of direction.

Send for this new booklet

J & S Form Grinding Service: Counterbores, Circular Form Tools, Hollow Mills, Gun Drills, Flat Drills, End Cutters, Boring Tools, Step Drills, Watch Drills, Etc.

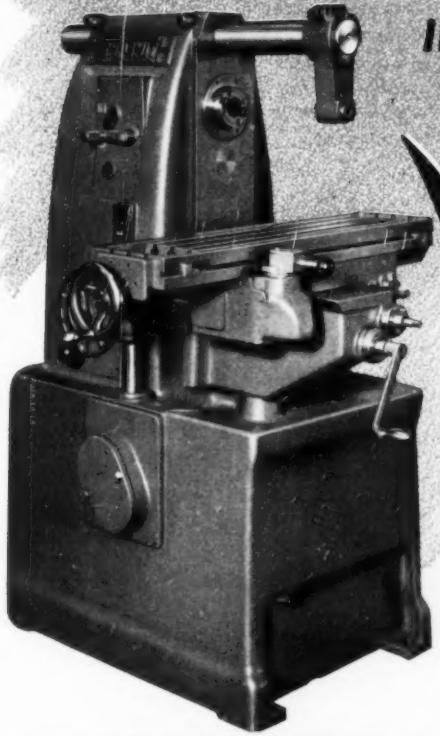
*Reg. U.S. Pat. Off.

J&S TOOL CO., INC.
479 Main Street, East Orange, N. J.
Representatives in Principal Cities



KEMPSMITH LH MILLER

IDEAL FOR THAT "IN BETWEEN" MILLING JOB



Yes — It's a light, horizontal milling machine — but RUGGED and DEPENDABLE like all Kempsmith Millers. Designed primarily to bridge the gap between low range hand millers and big, expensive machines, the LH MILLER combines simple, sound and rigid construction with flexibility and versatility — ideal for small end milling, high speed jig boring, keyways, oil grooving, light straddle milling, etc.

CUTS COSTS IN 3 WAYS — (1) Lowest initial investment and maintenance cost (2) Lowest possible setting up and tearing down time (3) Lowest power consumption. In addition, you are assured of the highest degree of accuracy and rigidity.

Write for Bulletin No. 127

THE KEMPSMITH MACHINE CO., 1823 SOUTH 71st STREET, MILWAUKEE 14, WIS., U. S. A.

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

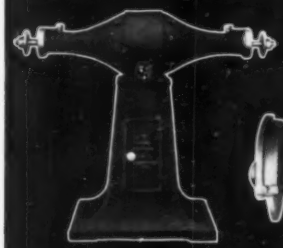
A 5508-1P-C

The Cincinnati TRADE MARK TRADITIONALLY FINE TOOLS!

ELECTRIC DRILLS
¼" TO 1¼"

GRINDERS—½ TO 15 H. P.

PORTABLE GRINDERS—5", 6", AND 8" WHEEL CAPACITIES



TOOL POST GRINDERS
¼ TO 1 H. P.

BUFFERS
½ TO 15 H. P.

MANUFACTURERS OF

Electric Drills
Screw Drivers
Nut Setters
Tappers
Routers
Portable Grinders
Tool Post Grinders
Speed Lathes
Bench and Pedestal Grinders
Bench and Pedestal Buffers
Abrasive Cut-off Machines
Air Master Dust Collectors

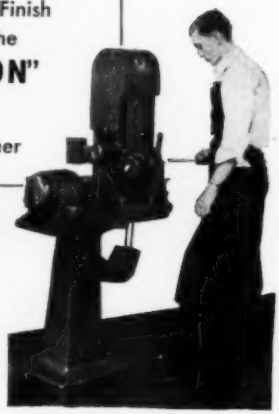
TRADE The Cincinnati MARK

THE CINCINNATI ELECTRICAL TOOL CO.

Division of THE R. K. LeBLOND MACHINE TOOL CO.

2615 MADISON ROAD • CINCINNATI 8, OHIO

High Speed, Fine Finish
is assured on the
"PRODUCTION"
TYPE S
Centerless Polisher



This modern machine is designed for handling cylindrical polishing as well as straight line finishing. It is ideal for surfacing, polishing or buffing, and can be used for anything that can be ground or polished including steel, brass, aluminum, rubber, fibre, wood, plastics, etc.

The Type S machine can be quickly changed from a horizontal to a vertical position and is fast and versatile.

SPECIFICATIONS

Abrasive Belt: 4" wide, 60" long.
Motor: 1 H.P., 1750 R.P.M.
Belt Speed: 3200' per min.
Dist. Table to floor. (Horizontal position): 36"
Table: 4½"x13½.
Ball Bearing equipped.

Illustrated literature is available promptly on request.

Production MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

D.O.James

Established 1888

MOTORIZED GEAR SPEED REDUCERS

A CENTRALLY BALANCED DRIVE WITH GREAT EMERGENCY STRENGTH

Simplified assembly using standard flange motors, coupling connected with high speed pinion gear shaft, making for greater accessibility.

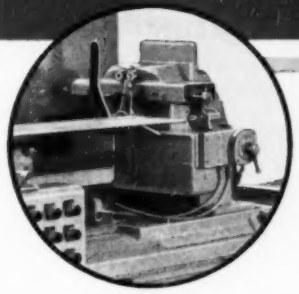
SINCE 1906...When the first D.O.James Motorized Gear Speed Reducer was built...We have improved the design and manufacture of Motorized Gear Reducers, maintaining in them the same high quality of manufacture as our other standard Gear Speed Reducers.

The many advantages of D.O.James Motorized Gear Speed Reducers and their continued proven performance for many years make them a leading choice with power transmission designers and engineers.

D.O.JAMES GEAR MANUFACTURING CO.
MAKERS OF ALL TYPES OF GEARS AND GEAR SPEED REDUCERS
1140 WEST MONROE STREET, CHICAGO, U. S. A.

Grinds both SPLINES and GEARS

Handles Work up to 48" Long . . .



For grinding involute gears and splines this machine can be equipped with the Geargrind Involute Trimmer. This has the capacity to true wheel from 32 to 4 diametral pitch.

● On this combination machine the work reciprocates past the grinding wheel, which automatically feeds down each time the work reverses. Grinding continues on one tooth space until a predetermined size is reached, after which the dresser moves into position for truing the grinding wheel. All operations are automatic.

After the wheel is dressed the operator finish grinds in the conventional manner, indexing automatically from tooth to tooth.

Grinding is 3 to 4 times faster than by any previous machine of comparable capacity, due to 1), reduction of total number of indices required, 2), less carriage travel due to short roughing stroke and 3), cycling control which prevents a slowing of the machine cycle. This also permits one man to operate more than one machine.

CAPACITY—SG-10x48A

Between Centers	Up to 48"
Spline OD	1" to 6"
Max. swing	12½"
Teeth	4 to 120
Face width	Up to 34"

Features—

Double column support for grinding wheel head.
Automatic, adjustable grinding wheel feed.
Automatic wheel feed for truing.
Automatically cushioned truing position.
Automatic lubrication of ways.
Axial grinding wheel spindle adjustment.
Work table speeds up to 70 ft. per minute.
Control panel, with counters to adjust grinding cycle, interlocking safety features, very accessible mountings of push buttons and other controls.
Long base eliminates work table overhang. New way guards.
Simplified stroke adjustment.
Adjustable work arbor supports facilitate loading.
Recessed dogs and stops, for operator's safety.

The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH., U.S.A.

Got a Benchgrinder?

add BAYFLEX® and LOOK what you can do!

SAWS
SHARPENS
SHAPES
FILES
FORMS
CUTS

ALUMINUM
BRASS
B X CABLE
CELOTEX
CONDUIT
COPPER TUBING
PLASTICS
STEEL
TRANSITE
MASONITE

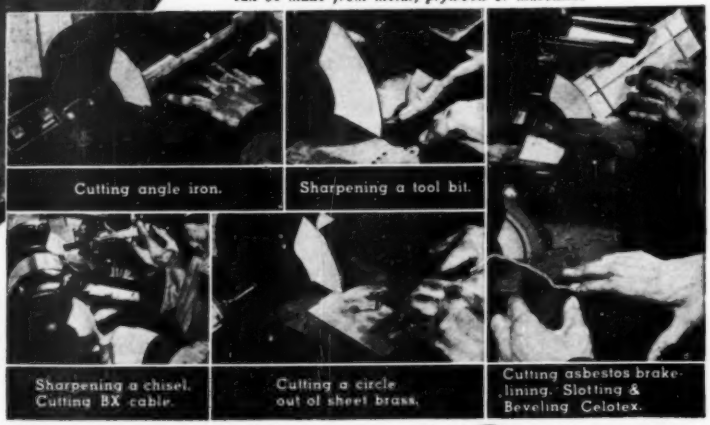
and numerous other materials

Jobs previously done by hand the slow, hard way with files and hacksaws are now accomplished in a fraction of the time by Bayflex wheels. Because of the extra strength and flexibility, the *side* as well as the *face* of Bayflex wheels is used.

It will pay you handsomely to investigate this revolutionary all-purpose abrasive tool. Send for literature today.

Branch Offices: Chicago — Cleveland — Detroit
Distributors: All principal cities

The simple, effective slotted work-rest seen in these illustrations can be made from metal, plywood or masonite.



Cutting angle iron. | Sharpening a tool bit.

Sharpening a chisel. Cutting BX cable. | Cutting a circle out of sheet brass. | Cutting asbestos brake-lining. Slotting & Beveling Celotex.

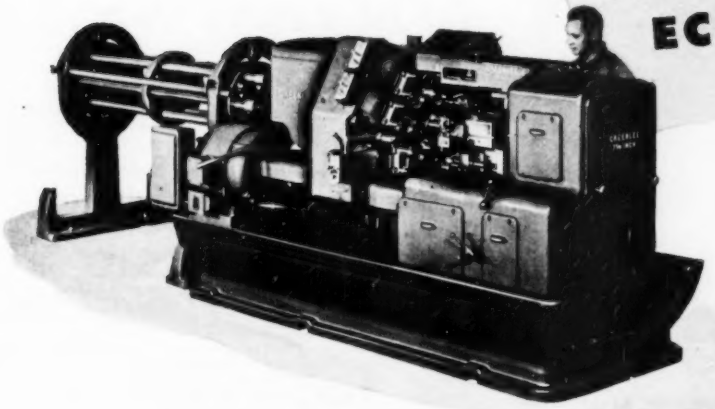
BAY STATE®

Top Performance Consistently Duplicated

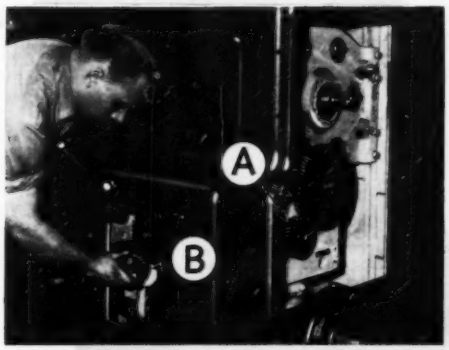
BAY STATE ABRASIVE PRODUCTS CO., WESTBORO, MASSACHUSETTS, U. S. A.

Build a bigger, better business . .

SHORT-RUN *and* LONG-RUN ECONOMY!



WITH GREENLEE SIX-SPINDLE AUTOMATICS



QUICK CHANGE FEEDS *and* SPEEDS

(A) Easily-changed helical gears control spindle speeds.
(B) Splined pick-off gears allow quick changes in feeds. A wide range of speeds and feeds are available.

GREENLEE *Automatics are often called "The Operator's Favorite".*

Yours can be a bigger, better business when you put more of your jobs on GREENLEE Automatic Screw Machines. Quick change-over features of the GREENLEE make even *short* runs profitable. You save money by having short down-times between jobs.

Standardized tooling — another important GREENLEE feature — has cut equipment costs to a minimum without affecting the efficiency or range of work of the machine. Also, *built-in* threading drive and feed mechanism handles either right-hand or left-hand threading operations as well as tapping and reaming.

Set-ups are speedily made with standard, interchangeable cross slide cams and a greatly simplified method of setting the main tool slide stroke on a graduated worm wheel.

It's easy to see why operators like the GREENLEE . . . it has convenient height, a wide-open tooling area, and a built-in lighting system that permits making fine adjustments quickly and accurately.

Use the GREENLEE for higher efficiency, better economy, lower costs, and greater profits . . . on either short-run or long-run work.

PRODUCTION MACHINERY

GREENLEE

WRITE FOR MORE FACTS

Let us send you our complete 20-page book showing details of construction and operation of Greenlee Automatics. Ask for Screw Machine literature.

GREENLEE BROS. & CO., 1721 MASON AVE., ROCKFORD, ILLINOIS

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

SPECIAL MACHINES BUILT TO ORDER

We have specialized in building machines and parts to our customers' drawings for 36 years. Send your blueprints for prompt estimates.

HARTFORD SUPER-SPACER *Special*

for JIG BORING WORK...

Here the Super-Spacer is demonstrating another of its advantages to any tool room. Equipped with a face plate for exact location of work, it can be used on your jig borer to save indexing time, *and* production cost per piece. The Super-Spacer takes milling, drilling, grinding, planing, slotting, boring and other operations in stride. Investigate its benefits to your shop. *Write Dept. S2.*

HARTFORD *Special*

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 5, CONN.

DIECRAFT "customized" Marking Devices

IDENTIFY Your Product

Whatever your product, whatever your material or construction, rely on DIECRAFT for the right Marking Device. Any design, any style, any quantity, made to your own specifications.

STEEL STAMPS—Hand Stamps, Inspectors' Stamps, Design and Trade Mark Stamps, Steel Type, Male and Female Dies, Roller Dies for Screw Machines, Steel Stamping Wheels, Embossing and Forming Dies, Special Marking Hammers.

BRASS DIES—Gold Stamping Dies, Embossing Dies, Brass Type, Branding Irons, Cement Marking Tools.

MACHINE ENGRAVING—Name Plates, Graduating, Dials, Scales.

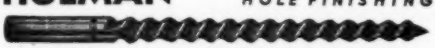
HOBS & MOLDS—Rubber & Plastics Molds, Casting & Forging Dies.

You think it up—we make it up!

DIECRAFT *"at your Service"*

1500-04 Guilford Ave. • Baltimore 2, Md.

HOLMAN *BETTER, FASTER HOLE FINISHING*



HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

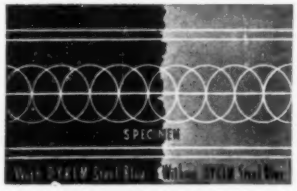
Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B North 11 St., St. Louis, Mo.
In Canada: 2400 Dundas St. West, Toronto, Ont.

WITH HANSEN COUPLINGS

QUICK-CONNECTIVE COUPLINGS FOR

- AIR
- OIL
- GREASES
- OXYGEN
- ACETYLENE
- GASES
- STEAM
- HYDRAULIC

CONNECTION TAKES ONLY A SECOND

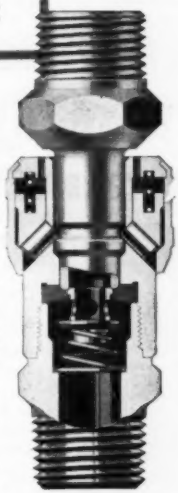
Threading fluid line couplings on and off to connect or disconnect is an unnecessary waste of time. Any line can be quickly and easily connected by using a Hansen Coupling. And, in addition, couplings have shut-off features that prevent loss of the liquid or gas in the line.

When you want to connect a Hansen Coupling, it is merely necessary to push the plug into place, where it locks securely. The valve opens, and flow starts instantly. The same operation disconnects—move the sleeve, and the plug pops out. Flow is shut off automatically.

From a wide range of available sizes and types you can select one suitable for any application. Air, oil, and gas, oxygen and acetylene, gasoline, hydraulic oil, and steam—each type of service has a Hansen Coupling engineered to meet its specific requirements.

If you have any fluid lines in your plant, you can increase efficiency, save precious minutes, by the use of Hansen Couplings.

Write for industrial catalog No. 47 today



REPRESENTATIVES

New England States: Pearse-Pearson Co., West Hartford, Connecticut, Boston, Massachusetts
Atlantic, Gulf States: B-R Engineering Co., Baltimore, Md.
Northern Ohio: F. & W. Ursem Company, Cleveland, Ohio
Southern Ohio, W. Va., Northeastern Ky.: Steinhagen Airline Products, Dayton, O.
Tennessee, Arkansas, Kentucky: Ralph A. Hiller Co., Nashville, Tennessee
Michigan: William H. Nash Company, Detroit, Michigan
Indiana, Wisconsin: Neff Engineering Company, Ft. Wayne, Indiana, Milwaukee, Wisconsin
Northern Illinois, Eastern Iowa: Walter Norris Engineering Company, Chicago, Illinois
Central Midwestern States: Sturgis Equipment Co., St. Louis, Missouri
North Midwestern States: Hanscome-Rogness Company, Minneapolis, Minn.
Texas, Oklahoma: C. C. Brownfield, Dallas, Texas
Colorado, New Mexico, Utah, Wyoming: E. C. Wild Co., Denver, Colorado
Northern Calif., Nevada: R. J. Gentles, San Francisco, California
Ariz., S. California: Chester Paul Co., Glendale, California
Idaho, Oregon, Washington: Jack J. Kolberg Company, Seattle, Washington

IN CANADA

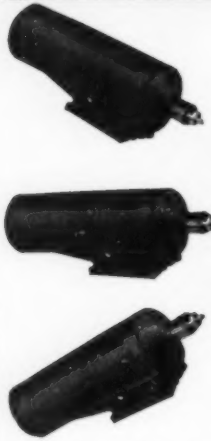
Province of Ontario: John Best Associates, Toronto, Ontario
Quebec & Maritime Provinces: Cowper Company Ltd., Montreal, Quebec

QUICK CONNECTIVE FLUID LINE COUPLINGS . . .

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 11, OHIO

FOR EXTREME ACCURACY AND FASTER PRODUCTION



Use the New BLACK Drilling Unit

● Black Drilling Units, designed to operate in any position, employ an entirely new principle. A traversing motor shaft is the work spindle. Because spindle and motor rotor are integral, torque is applied evenly around the spindle. Air feed provides rapid shockless advance to the work. Hydraulic control from this point provides uniform drill feed, even when breaking through. Adjustable oversized bearings insure long life. Jacobs chucks are standard, but No. 2 female Morse taper can also be supplied.

Micrometer stop insures depth accuracy to .001". Calibrated stop control makes adjustment easy. Interlocking and auxiliary controls are easily installed.

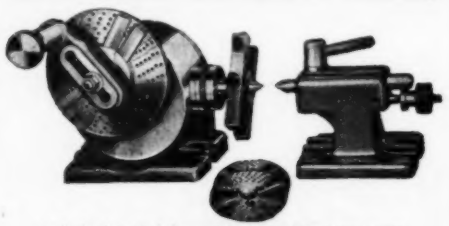
Sizes from ¼ to 1 HP have the same base-to-center-of-spindle dimension for interchangeability. Speeds from 840 to 3450. Voltages 209 to 550, 3 ph., 60 cycles. Sizes to 10 HP can also be supplied. Units are adaptable to any operation requiring a combination of rotating and traversing motions.

Write for detailed information.

BLACK DRILL CO., *Division Black Industries*

1388 East 222nd Street • • • Cleveland 17, Ohio

L-W HIGH QUALITY UNIVERSAL DIVIDING HEADS



Made by America's Largest Builders of Dividing Heads

ACCURATE AND LOW PRICED, TOO!

Well built for hard daily usage. Rugged head and tailstock. Alloy steel spindle has a tapered bearing. Head tilts to 90° in vertical position. Special alloy steel worm and bronze worm wheel cut to close limits for accuracy. Complete with three index plates for dividing all numbers to 50 and even numbers to 100, with the exception of 96T. Index chart shows all divisions obtainable to 380.

Model AU 11" Swing Dividing Head Fully Universal for complete indexing and spiral cutting . . . $254.75

Model BP 11" Swing Universal Dividing Head for plain milling machines . . . $176.00

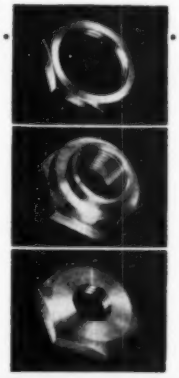
Model SD 6½" Swing Universal Dividing Head for Smaller Milling Machines (Illustrated) . . . $105.50

Send for complete catalog giving prices and specifications on these quality, low cost L-W Products
L-W CHUCK COMPANY
25 S.C. ST. CLAIR ST.
TOLEDO 3, OHIO

FOR *FAST* DELIVERY AND SERVICE ON

NUTS

TURN TO WESTFIELD

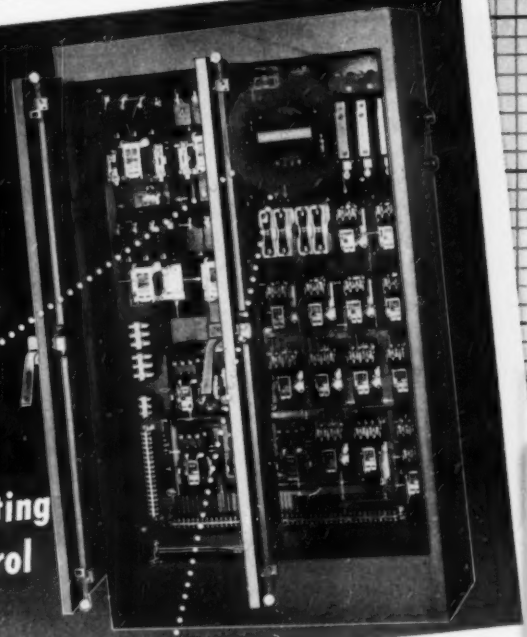


WHEN IT'S HIGH GRADE NUTS, Standard or Custom Made, turn to Westfield for fast delivery and service. You'll find Westfield big enough to meet your needs on time and right—not too big to take an active, practical interest in your special requirements . . . Westfield Nuts are *milled from the bar* to exact specifications. They're economical in themselves and speed up assembly line production . . . Tell us your needs! Send drawings and data for suggestions and prices! Write or call Department 105

WESTFIELD METAL PRODUCTS CO. INC.

WESTFIELD, MASS.

DESIGN LEADERSHIP

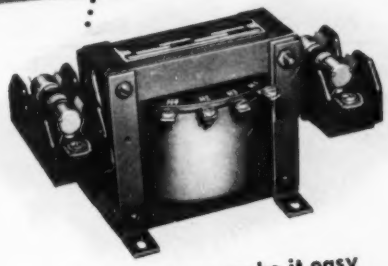


Another good reason for selecting Square D Machine Tool Control

Square D's line of machine tool control is an ever-growing line—keeping pace with the expanding requirements of the machine tool industry. That's why practically any performance requirement can be met with a combination of standard Square D devices, every one of which is designed specifically for machine tool applications.

New Control Transformers a good example of Design Leadership

Rapidly growing demand for the low voltage safety element in motor control circuits has focused attention on the need for a transformer designed to supply A. C. magnetic starters, contactors and solenoids typical of such systems. Square D's new line of transformers meet that need—exactly.



These features make it easy to meet Low Voltage Requirements

Lower Voltage Drop—unusually low impedance gives good regulation. Designed to handle the high inrush currents typical of A.C. magnets.

Secondary Circuit Protection—provided by easily adding Square D bracket and fuse block unit-assembly. One or two can be added to any of the transformer sizes—maximum flexibility with minimum stocking.

Dual-Voltage Primary—(optional) primary winding reconnectable for either 220 or 440 volts—required by "Automotive Standards."

Write for Bulletin 215...Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

COMPLETELY **NEW**
CASE HARDENING PROCESS

Carburit

ULTRA RAPID PACK
HARDENING PASTE

HIGH RAPIDITY OF PENETRATION
.040" in 25 to 30 Minutes

SOLVES PROBLEM OF SELECTIVE HARDENING
by applying only to desired sections

NO SPECIAL FURNACES OR EQUIPMENT NEEDED
—even an open fire will suffice

ENORMOUS TIME SAVING
— repair units can be hardened right in maintenance shop. No special training required

CARBURIT IS NON-TOXIC

Isopac

ISOLATING PASTE

KEEPS DESIRED SECTIONS SOFT

While rest of workpiece is being hardened

REPLACES COPPER PLATING—
and other expensive methods.

JUST PUT ON AND KNOCK OFF
Saves time, money.

PREVENTS PENETRATION OF CARBON AND SLOWS DOWN COOLING OF COVERED SECTION.

NO SHRINKING OR CRACKING

Guaranteed Results

Send for completely descriptive circular

DENFIS *Chemical Laboratories Inc.*

172 PACIFIC ST. (Phone UL 5-5295) BROOKLYN 2, N. Y.

LAYOUT FLUID

Send for Your FREE Sample

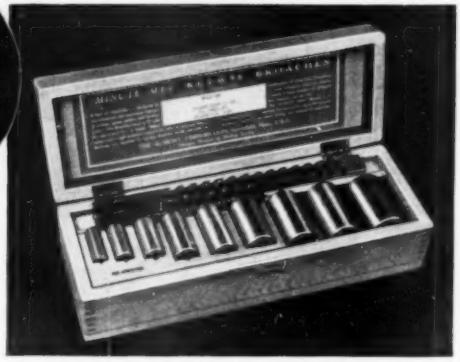
For Machinists, Toolmakers, Diemakers, Model Makers, Template Makers and Layout Men—also for general machine shop and toolroom use on tools, dies, jigs and fixtures and machine surfaces, this Layout Fluid has a considerable advantage over the old copper sulphate method.

With the use of this Layout Fluid, you simply wipe the surface clean and brush it on. It dries instantly.

SEND FOR YOUR FREE SAMPLE of this Combination Brush-in-can. Please use your letterhead.

DAYTON ROGERS MFG. CO.
Minneapolis 7, Minnesota

THIS KIT BELONGS IN YOUR SHOP



With it you can cut keyways by hand *in one minute* in gears, cutters, couplings, collars, pulley hubs, etc.

QUICKLY PAYS FOR ITSELF

Cut a few keyways — the Kit covers a wide range of standard widths and depths — and you've saved the cost of the Kit and of a du Mont Arbor Press for this and many other shop uses.

Ask your *Industrial Distributor* to show you **the du MONT *Minute Man*® KEYWAY BROACH KIT** or *mail this coupon*

The du MONT CORPORATION, GREENFIELD, MASS.

Please mail me the *Minute Man* Manual A containing complete description and prices of Keyway Broach Kits and valuable reference information.

Name ..... Position .....

Company .....

Address .....

BUY ★ U.S. ★ SECURITY BONDS NOW!

New Federal Hydraulic Flash Welder Makes Difficult Aluminum Welds Easy

OPERATION HERETOFORE CONSIDERED IMPRACTICAL NOW A PRODUCTION LINE REALITY

The Federal Machine & Welder Company developed for one of the nation's largest manufacturers of bus window and door frames, a hydraulically operated flash welder that would weld together sections of aluminum framing. The new welder turned a difficult and costly job into an inexpensive, high speed production operation.

This is another example of Federal welding "know-how" — another reason why Federal is first in resistance welding.

FEDERAL HYDRAULIC FLASH WELDER OFFERS THESE *Exclusive Features*

1. No tools required to set up or change the amount of upset, flash, final platen opening, pre-heat or position of current cutoff.
2. Change in final platen opening will not affect any other adjustment.
3. Change in position of current cutoff will not affect any other adjustment.
4. Change in adjustment to increase or decrease the amount of upset or flash will not change the relation of current cutoff to upset, finish, amount of pre-heat or final platen opening.
5. Complete control over upset speed.
6. Advantage of a two-speed upset for the welding of aluminum and other material requiring a rapid closure and slower forging action for best results. The speed of the forging action is adjustable.
7. It is not necessary to change flashing cams to weld steel, aluminum, copper, brass, or cast iron in any cross sectional area within the capacity of the machine.
8. Time necessary for a new setup when changing the machine from welding one material to another is a matter of minutes, where a die change is not required.
9. Retractable stroke for loading and unloading odd shaped pieces or parts loaded over locating pins. This feature is incorporated as part of the design and does not require any extra mechanism.
10. Platen may be slightly retracted in order to flash weld parts that must be loaded tight together. This feature, too, is a part of the design, requiring no extra mechanism.

RESISTANCE WELDERS FOR EVERY APPLICATION • FROM 50-TON OBI TO 2000-TON DOUBLE ACTION

Federal® WELDERS

THE FEDERAL MACHINE AND WELDER COMPANY
Dept. 119 Warren, Ohio • • Offices in Principal Cities

Warco® PRESSES

ROTO-MATICS

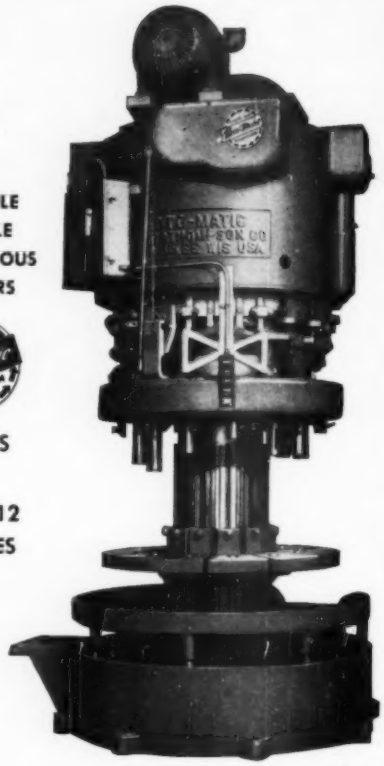
VERTICAL

MULTIPLE SPINDLE CONTINUOUS DRILLERS

DAVIS and THOMPSON Roto-Matic

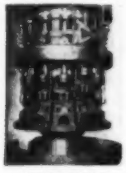
3 SIZES

6-8 OR 12 SPINDLES

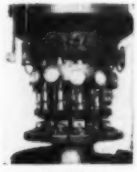


One Vertical ROTO-MATIC will equal the production of a whole battery of single spindle drillers with a proportionate reduction in labor and maintenance costs.

Where production demands fall below the capacity of the machine, on a single part, interchangeable fixtures can be designed for a variety of jobs. Where two operations are required on a single piece, requiring the same feeds and speeds, spindles can be arranged to give you the proper ratio of production.



2 SPINDLE DRILL HEADS



BALANCING OPERATION

AUTOMATIC CLAMPING

Engineering skill and thirty years of development have given us the necessary background to tool up these machines for the maximum in efficiency and accuracy of work, whether it be drilling, milling, boring, reaming, spot facing or chamfering.

WRITE FOR BULLETIN 101.

DAVIS and THOMPSON CO.

MANUFACTURERS OF *Machine Tools*

MILWAUKEE 14, WISCONSIN

Whiton

INDEPENDENT LATHE CHUCKS

All types of machines

MULTI THRUST Feature

Gives Jaws "Steel Finger" Action

- Tighter Gripping
- More Rigidity
- Greater Accuracy
- Even Distribution of Pressure

Try it yourself. Pick up a piece of work in your fingers. That's ordinary holding. Now squeeze . . . that's Whiton Multi-Thrust "Steel Finger" action.

Work Holding Problems? Write Whiton

Ask for catalog, too.

Makers of Fine Chucks • Steam Turbines
Centering Machines • Gear Cutting Machines

THE WHITON MACHINE COMPANY
NEW LONDON, CONN.

LINLEY

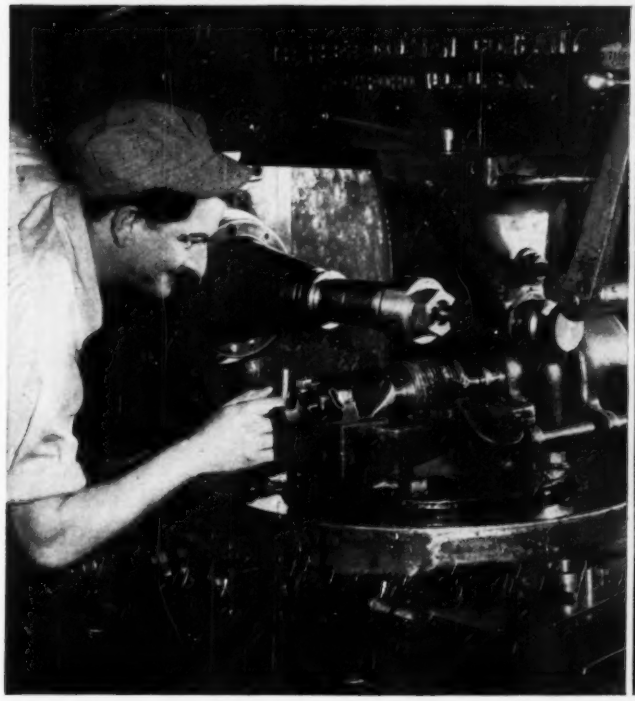
for NOISELESS, HIGH SPEED RIVETING

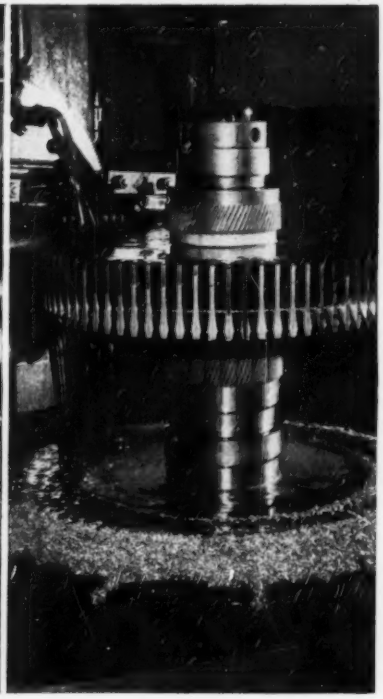
Rotary spinning principle shapes uniform heads, silently . . . capacities up to ⅜ inch diameters. Adjustable spindle stroke, controlled pressure . . . double row radial thrust bearing supports spindle, assures long life. Table elevating screw prevents slipping. Six floor or space-saving bench models . . . sturdily built for trouble-free operation under severe production schedules.

FOR COMPLETE INFORMATION, WRITE FOR BULLETIN.

LINLEY BROTHERS CO., 664 STATE ST. EXTENSION BRIDGEPORT 1, CONNECTICUT

Analyze the whole Picture...





When you select Cutting Fluids

IN SELECTING cutting fluids for your machining operations consider your choice from every angle. Will it increase production? Will it lower production costs? Will it improve finish? Will it meet all other requirements peculiar to your operation?

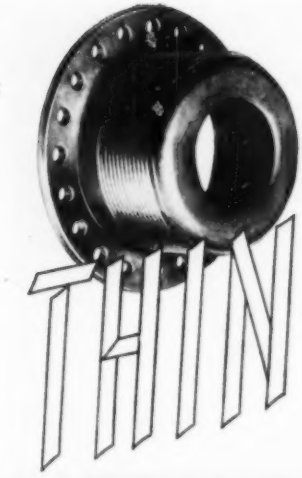
When you look at the whole picture you'll want to investigate the advantages to be gained by specifying the dependable, service-proved cutting fluids of Cities Service. Such products, for example, as Cities Service Chillo Oils which have been performance tested in scores of machine shops.

Why not let a Cities Service cutting oil specialist help you select the best type and grade for your purpose? His recommendations may bring you substantial improvements in the quantity and quality of your production.

Free

Write today for our new and informative booklet entitled "Metal Cutting Fluids". Address Cities Service Oil Co., Room 282, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE



Thread THIN-WALL parts too!

THE CRI-DAN HIGH SPEED THREADING MACHINE

is a natural for parts too thin-shelled for roll or die threading. Delicate shoulders are not shoved over . . . there's no distortion . . . no deforming . . . no resulting scrap! Interested? Write for Cri-Dan Bulletin 75-A . . . it tells "The Advantages & Economies of Single Point Threading".

The LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

Which of these books will be most profitable to you?

HOW TO BECOME A BETTER SUPERVISOR

Improved Foremanship

Here is the specific, down-to-earth information that can help you most toward success. In good plain "shop talk" this book tells you exactly how all the different aspects of a production supervisor's work can be handled to best advantage—how, for instance, to train a new worker, settle a grievance problem, win the confidence of a difficult boss, get the best cooperation from other departments, gain the liking and respect of your workers and superiors alike, keep your production up, complaints down. "As readable as a good novel," says one foreman, ". . . and there is hardly a sentence that does not carry an important point."

1000 PRODUCTION AIDS

Illustrated Jig-Tooling Dictionary

988 working drawings, with concise explanations, show you at a glance what you want to know about the design, construction and use of any piece of tooling equipment. Here is a wealth of useful, up-to-date data not only on jigs and fixtures but also on dies, welding, plastic molding, machine tools and allied tools and procedures.

HOW TO GET YOUR GOOD IDEAS INTO PRODUCTION

Simplified Punch & Diemaking

Two expert toolmakers give you the best, most practical information on methods and materials for the design and construction of all types of punches and dies for fabricating sheet metal. One tool and diemaker of 30 years' experience wrote that he found this book so informative and so interesting that he sat up nights reading it! Full reference tables included.

See Them on Approval

The Macmillan Co., 60 Fifth Ave., N.Y. 11

Please send me on 10 days' approval a copy of each of the books checked below.

- ☐ **Improved Foremanship ($3.50)**
- ☐ **Illustrated Jig-Tooling Dictionary ($7.50)**
- ☐ **Simplified Punch & Diemaking ($5.00)**

Signed _____

Address _____

Company _____ A

AS NEAR AS YOUR TELEPHONE

A new V-Belt service by Dayton, to save you time and money three ways:

1. "Drive Proved" V-Belts—the right belt for your particular drive. For Dayton has made more than 100 million V-Belts. They have been "Drive Proved" in every kind of industry, under every possible operating condition of heat, cold, dirt, dust and oil. They have proved their ability to save space; provide positive power; start and stop smoothly; run quietly, without vibration and last longer than any ordinary belt.

2. As Near as Your Telephone. There is a Dayton V-Belt Distributor near you. He is equipped with the specialized knowledge to recommend the right drive for you. You'll find him listed in the classified section of your telephone directory or his representative is now calling at your plant.

3. Instant Maintenance Service from Local Stocks. Your Dayton Distributor maintains complete stocks of Dayton "Drive Proved" V-Belts and pulleys. He is prepared to give you instant service for existing or future drives, and to provide you with an immediate source of mill supplies.

Put this new service to work in your plant now. Equip your drives with Dayton "Drive Proved" V-Belts and be sure you are getting the maximum in drive performance and service. Call your Dayton V-Belt Distributor today. *The Dayton Rubber Company, Dayton, Ohio.*

ONLY Dayton V-Belts are "DRIVE PROVED" for the Job!

Dayton Thorobred—for normal and heavy duty drives.
Dayton FHP—for small machines and appliances.
Dayton Cog—for shortest centers, smallest pulleys.
Dayton Steel Cable—for extreme loads and speeds.

ALL STOCKED BY YOUR LOCAL DAYTON V-BELT DISTRIBUTOR

Dayton Rubber

KUX

MODEL K

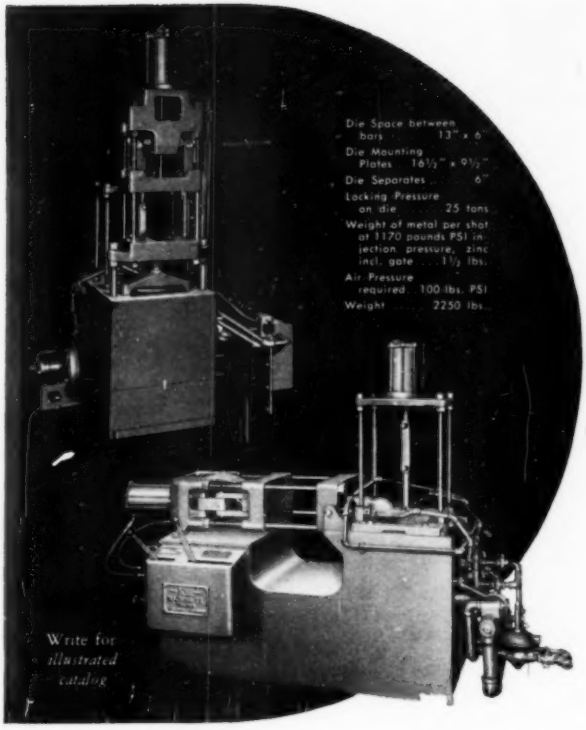
THE MIGHTY MIDGET OF DIE CASTING MACHINES

. . . is the safest, most highly productive small die casting machine on the market! Available in horizontal or vertical center shot models, die castings weighing up to 1½ pounds in zinc are produced under high injection pressures, insuring quality, castings with minimum porosity.

Compare these features:

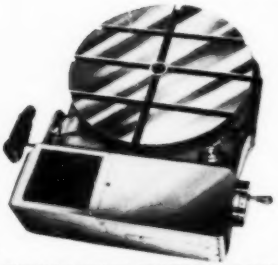
Center shot operation with floating nozzle always in seated contact with the die and one-piece gooseneck. Speed and power obtained by use of an air compressor to operate opening and closing of die, and metal injection plunger. Double safety lock, mechanical-electrical, prevents metal shot while die is in open position. Double toggle mechanism locking in two directions absorbs all locking pressures, operates on all four corners of die plate. Built-in ejector plate for positive ejection. Self-contained gas or oil firing unit.

KUX MACHINE COMPANY
3925 W. HARRISON ST. • CHICAGO 24, ILL.


Die Space between bars ... 13" x 6"
Die Mounting Plates ... 18½" x 9½"
Die Separates ... 6"
Locking Pressure on die ... 25 tons
Weight of metal per shot at 1170 pounds PSI injection pressure, zinc incl. gate ... 1½ lbs.
Air Pressure required ... 100 lbs. PSI
Weight ... 2250 lbs.
Write for illustrated catalog

Production Boosters

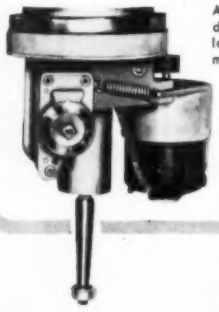
Mail Coupon For Complete Details



SINGLE UNIT MOTOR DRIVEN 20" ROTARY TABLE

A self contained motor driven unit for use on any milling machine, horizontal boring mill or work bench for rotary milling or indexing. Eliminates set-up time. No installation — just plug into nearest electric outlet. Geared-down motor gives plenty of power. 18 Feed changes, 1½" to 54" or 3" to 108" per minute. May also be used as automatic revolving fixture.

HOLE GRINDING ATTACHMENT



Accurately and quickly finishes holes and bores up to 6" diameter in hardened parts. Simplifies handling work too large to swing in standard machines. Special adaptors permit easy installation on any milling machine.

Both Will Increase Output And Lower Costs—Write **NOW!**

ATTACH TO COMPANY LETTERHEAD

W.B. KNIGHT MACHINERY CO. 3920 West Pine, St. Louis
Send information and prices immediately on
☐ **20" Rotary Table** ☐ **Hole Grinding Attachment**
Name _____
Title _____

KNIGHT VERSATILE ACCURACY RIGID

W.B. KNIGHT
MACHINERY COMPANY

MORE GOODS for MORE PEOPLE at LOWER COST

3920 WEST PINE BLVD • ST. LOUIS 8, MISSOURI

SNYDER

MACHINE FOR BORING BIG FORGINGS

Removes 88 Cubic Inches of Forged Steel per Minute

Designed and built by Snyder for use in foundries and steel mills this machine is suitable for boring all types of large forgings and castings.

Steel car wheels are rough bored, removing 1" of stock from a 5¾" diameter pierced hole 7½" long, in 55 seconds.

Old equipment bored 6 to 8 wheels an hour. This Snyder machine bores 40 steel wheels or 70 cast iron wheels an hour. Operation is automatic—practical for unskilled help. A similar machine is designed for finish boring.

24 Years of Successful Cooperation with Leading American Industries

SNYDER TOOL & ENGINEERING CO.

3400 E. LAFAYETTE, DETROIT 7, MICHIGAN

The

GOSS & De LEEUW

ONE TWO THREE

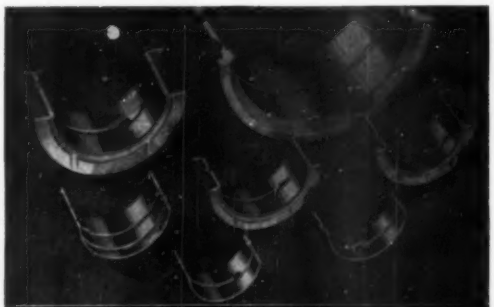
7 spindle tool rotating automatic chucking machine

Four Machine Spindles for boring, turning, facing and reaming operations on one to three ends provide greater and quicker production than any other "chucker" in the machine tool industry.

Three Threading Spindles perform from one to three right or left hand single or double threading operations, on one, two or three ends simultaneously, in perfect alignment, at productions from 100 to 500 pieces per hour.

Write for further interesting details.

Goss & DeLeeuw
MACHINE COMPANY
KENSINGTON, CONNECTICUT, U.S.A.



Production Slitting of Bearings with DoALL Contour Saws

Accuracy and speed are requirements in slitting bearings. Bearings shown above were taken at random from production lines where slitting is done by DoALL Contour Saws. These versatile machines make jobs more profitable because they surpass the speed and economy records of other machines. Send for literature showing the advantages of DoALL Contour Saws.

The DoALL Co.
World-Famous Contour Saws
Des Plaines, Illinois

60 YEARS MANUFACTURING

Multiple Spindle Drilling and Tapping Machines — Automatic Drilling and Tapping Units — Multiple Spindle Attachable Drill Heads — Hot and Cold Swaging Machines — Hammering Machines — Tools, Jigs & Fixtures — Contract Work — Special Machinery

LANGELIER MANUFACTURING COMPANY,
PROVIDENCE 7, RHODE ISLAND

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER of ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

WHO...

makes precision "milled from the bar" screw machine products that stand up under hard usage... and build up sales through customer demand?

W H. O Ottemiller Co., YORK, PA. of course!

Write today for the new eye-catching folder that illustrates and describes our famous line of ...

CAP SCREWS • SET SCREWS • COUPLING BOLTS
and MILLED STUDS in all sizes and threads

What to do about tough jobs

PUT a Standard Red Shield Drill or Reamer at work on your tough jobs. It will demonstrate its merit there—in time saved—in cost saved—in uninterrupted production.

These tools are made and stocked in all the sizes and designs regularly used by industry.

They are distributed coast to coast by leading Mill-Supply Distributors.

Our 66 years' experience in solving tough drilling problems is at your disposal without obligation. Write us today about your tough problems.

THE STANDARD TOOL CO.
CLEVELAND

Warehouses: New York • Detroit • Chicago

STANDARD TOOL CO.

THE STANDARD LINE • Drills • Reamers • Taps • Dies • Milling cutters • Special Tools

When you need the right gear *in a hurry*

It's one thing to get a gear cut exactly to your specifications . . . and another to get it *on time*. To be sure of satisfaction *both* ways, there's only one safe thing to do: specify Grant gears. For, whether you order by 'phone, telegraph or letter, Grant will have just the gear you want on its way in a matter of hours.

Next time a gear breakdown threatens a costly production tie-up, remember Grant's "in-the-pinch" service. Send today for free catalog of "In Stock" gears.

Reduction Units?
Grant has all types.
Write for catalog.

Grant
FOR GEARS

GRANT GEAR WORKS, INC.
154 W. SECOND STREET
SO. BOSTON, MASS.

Geared for Economies
Purchasing and Production men agree, "For right price, for easy installation and operation" — it's gears by
BRAUN
Braun has complied with manufacturer's specifications, delivery and price requirements for 38 years. This extensive experience is aided by our up-to-date plant. Braun is a reliable, economical source for gears. Send your inquiries without obligation.
BRAUN GEAR COMPANY
239 RICHMOND STREET
BROOKLYN 8, N. Y.

CINCINNATI
Coniflex*
Smoother . . . Quieter OPERATION
. . . WIDER OPERATING TOLERANCE
An outstanding characteristic of Cincinnati Coniflex* Gears is the localized tooth contact. This permits a wider operating tolerance . . . allowing slight deflections in operation without dangerous concentration of the load at the ends of the teeth.
For smoother . . . quieter operation, with easier and faster assemblies . . . we suggest Cincinnati Coniflex* Gears.
* Registered in the U. S. Patent Office.
THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

GANSCHOW CUT GEARS

SPUR—SPIRAL
BEVEL—RACK
AND PINION

UP TO 60" PITCH DIA.
UP TO 10" FACE WIDTH

GANSCHOW GEAR CO • 14 N. MORGAN ST CHICAGO 7.

ATLANTIC FOR GEARS

Our service on small gears, due to new equipment recently installed, will interest you.
Send samples or blueprints for quotation

ATLANTIC GEAR WORKS, INC.
200-D Lafayette St., New York 12, N. Y. Phone CAnal 6-1441

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

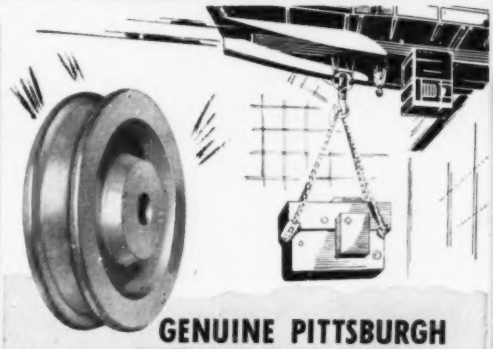
Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.



GENUINE PITTSBURGH
ARMORED
CRANE WHEELS

Extra Hardness for Longer Life

Yes, this Line of Pittsburgh ARMORED CRANE WHEELS is your answer for a stronger, shock resisting wheel. Treads and flanges Armored to 601-712 BHN. for extra hardness and longer life. Prompt deliveries.

WRITE FOR QUOTATIONS

ARMORED CRANE WHEELS

Distributors' Inquiries Invited

PITTSBURGH GEAR COMPANY | 27th & Smallman Streets PITTSBURGH 22, PA.

QUALITY GEARS FOR OVER 30 YEARS

MP QUALITY GEARS CUT TO ORDER MP

• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the one gear suited for your job.

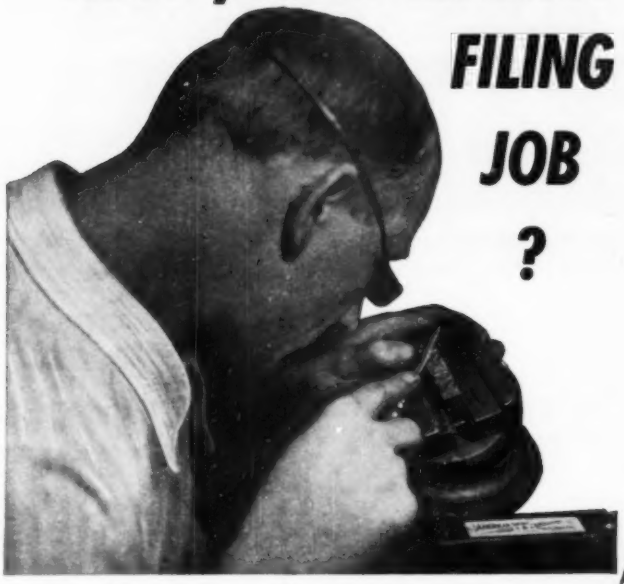
MP MEISEL PRESS MFG. CO. MP
946 Dorchester Avenue • Boston, Mass.

GEAR CUTTING MACHINES
Well Designed
Good Features
Create Production Advantages

43 Years' Experience

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*

Have you an Intricate FILING JOB ?



USE

"AMERICAN SWISS"

Swiss-Pattern Files

Sharp edges, close corners, tiny fillets, delicate curves . . . the troublesome contours of intricate filing jobs . . . are best handled with "American Swiss" Swiss-Pattern Files. You can get these precision tools in widths as small as 1/16-in. thicknesses as small as .025 gauge, and in cuts as fine as No. 6. The extensive "American Swiss" line of more than 3000 shapes, sizes and cuts provides a selection to meet every intricate filing need.

Also American Pattern Files, Milled Curved Tooth Files, Rotary Files and Mechanics' Tools

AMERICAN SWISS FILE & TOOL CO.
Elizabeth 1, New Jersey

ASK FOR THEM BY THIS NAME

American Swiss ★★★

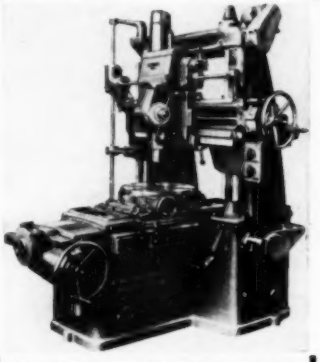
SWISS PATTERN FILES

WHY YOU SAVE MONEY 2 WAYS WITH THIS SWISS JIG BORER!

Check These Facts:

1 You *Step-up Production, Reduce Costs* and get a *Higher Quality Product with Finer Finish* because this borer is a *high-precision Swiss* machine. Its automatic features are capable of fine adjustment with highest possible accuracy. Result: increased production, a perfect finish to the closest limits, and longer life for the tools. But this is only one of the ways you save money!

2 You save money in *first* cost on this Swiss jig borer because you buy direct from this manufacturer. Not only is this important Swiss tool priced no higher than corresponding domestic tools, size for size and capacity for capacity, but, because this manufacturer maintains its own sales offices in the United States, many extra charges are eliminated, making it possible for you to obtain this precision Swiss jig borer at astonishingly reasonable cost.



Model 4C illustrated, with 18 spindle speeds from 45 to 2,000 R.P.M., provides the correct range for all jobs up to the maximum drilling capacity of 1¼". Six automatic feeds of the boring spindle from 0.0008" to 0.0080" per revolution operate when rising and descending.

Positive Accuracy—Stabilized measuring screws of special heat treated steel, equipped with corrector bars to compensate for small pitch errors, assure positive accuracy of setting to 0.0002".

HAUSER
MACHINE TOOL CORP.
MANHASSET, L.I.

Representing Henri Hauser, Ltd.
Bienne, Switzerland

Get illustrated bulletin giving complete details and specifications for this Hauser Jig Borer.

Mail This Coupon Today!

HAUSER MACHINE TOOL CORP.
Manhasset, N. Y.

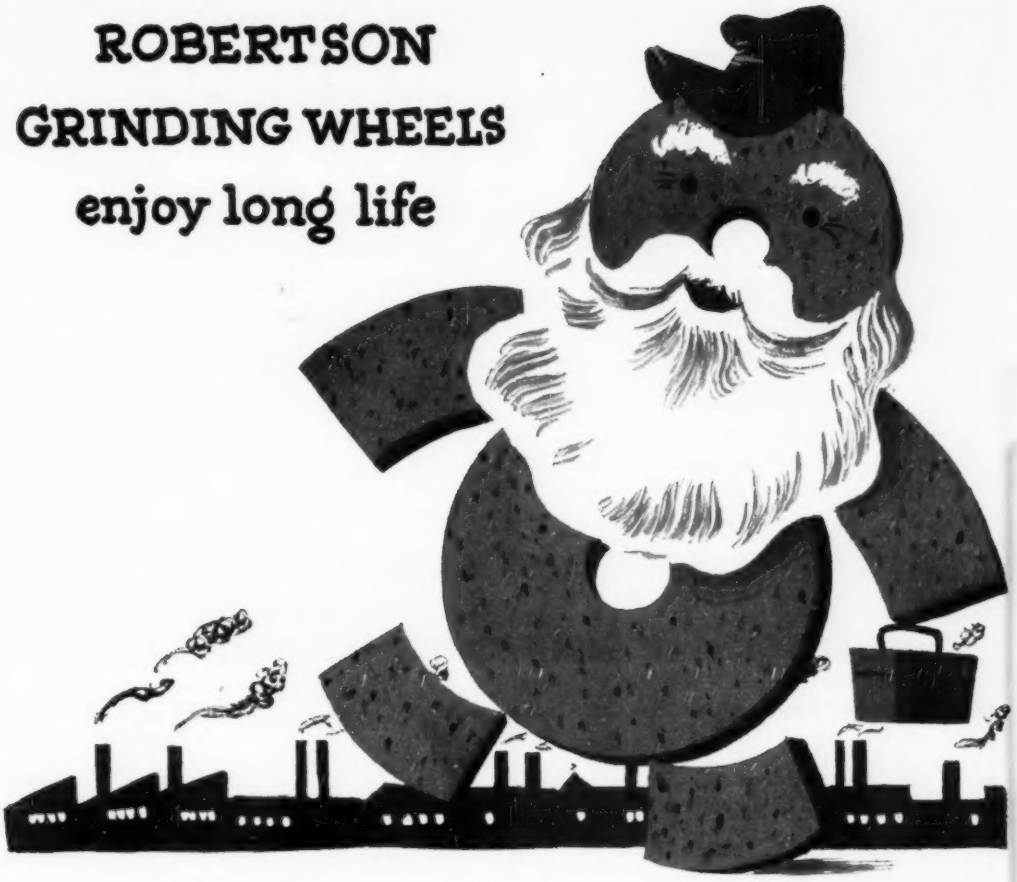
Kindly send illustrated bulletin giving complete details of Hauser Jig Borer 4C.

Name .....

Address .....

City ..... Zone ..... State .....

ROBERTSON GRINDING WHEELS enjoy long life



Why does a Robertson outlast a conventional wheel? Because it doesn't "load." Its revolutionary open structure leaves plenty of space for chip clearance, and the wheel retains its free-cutting qualities much longer than conventional wheels. You don't wear a Robertson out dressing it. A Robertson is *not* simply a conventional wheel of extreme hardness. It is radically different . . . and better.

Here's one example of Robertson's ability to do its work with the minimum of wear:

. Using a Plain Cylindrical Grinding Machine to remove .015″ to .020″ stock from 1040 steel ground to a tolerance of plus .001″ minus .000″, a manufacturer of motor shafts was able to finish only 10 pieces per wheel-dressing. Production was being slowed by the frequent work-stoppage to dress the wheels. When he substituted an RA46 MV Robertson Wheel on the same job—and with no change in grinding method—production immediately increased from 10 to 30 shafts per wheel-dressing. Additional results: Longer wheel life, decreased production costs.

Let us show you how Robertson Grinding Wheels can reduce your wheel costs, help increase production and give you a substantial bonus in decreased power consumption. Write on your business letterhead for a demonstration. Or blueprint your grinding problem and let us recommend a wheel for that specific job.

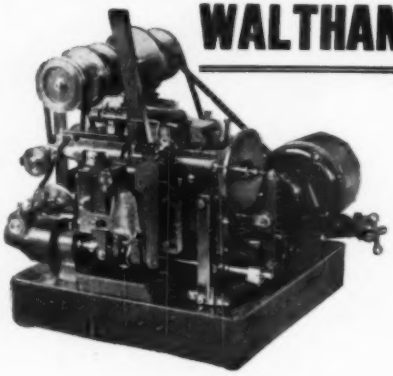
ROBERTSON COOL-CUT

ROBERTSON MANUFACTURING COMPANY

TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

WALTHAM PINION and GEAR CUTTING MACHINES



Precision and Economy in Mass Production of Small Parts

Specially designed for high speeds and close accuracy, cutting straight teeth in fine pitch pinions, gears for small mechanisms, Waltham Machines are fast, convenient and time-proved on a wide range of work. In all types the same cutting method is employed, by which successive cuts are made by a revolving cutter, blanks being held and indexed by the work spindle. Special cutters furnished to customers' specifications.

Write for illustrated literature giving detailed description and specifications.

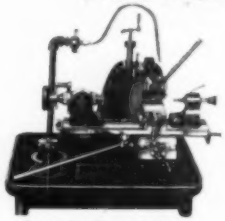
TYPES AVAILABLE

Single Cut Pinion Machines—employing one cutter
Multiple-Cut Pinion Machines—employing 2 or 3 cutters
Magazine-Fed Pinion Machines—fully automatic
Gear Cutting Machines—single and multiple cut types

WALTHAM MACHINE WORKS
HIGH STREET, WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

Derbyshire
Micromill



Small Precision Milling Machine and Grinder

VERTICAL MICROMETER FEED	1.73"
VERTICAL LEVER FEED	.984"
CROSS FEED OF TABLE	1.26"
LONGITUDINAL FEED	3.15"
MAXIMUM DISTANCE SPINDLE TO TABLE	2.95"
ALL SCREW FEEDS WITH MICROMETER ADJUSTMENT TO	.001"

F. W. DERBYSHIRE, INC.
Waltham 54, Massachusetts

Famous for
- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on Page 180 Dec. 2, '48 American Machinist

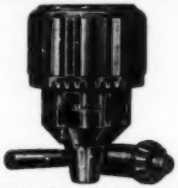
THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Pacific Coast Representative: *A. C. Behringer, 554 N. San Pedro St., Los Angeles California.* Canada: *F. F. Barber Machinery Co., Toronto, Canada.*

BAUMBACH *The* DIE SET AUTHORITY

All Baumbach Die Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

E. A. BAUMBACH MFG. CO., 1804 S. Kilbourn Ave., Chicago 23, Ill.

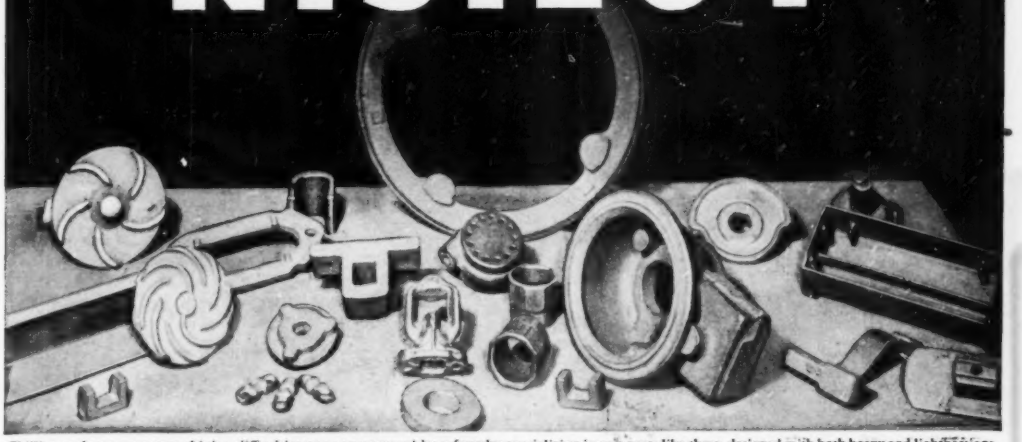
ALMOND DRILL CHUCKS



Maximum Gripping Power with Extreme Accuracy and Long Life
Write for Catalog
T. R. ALMOND MFG. CO.
Ashburnham, Mass., U.S.A.

SPECIFY THE ADDITION OF

NISILOY*



Chilling and consequent machining difficulties were encountered by a foundry specializing in cast parts like these, designed with both heavy and light sections. Nisiloy, added to the ladle, assured ready machinability after many other experiments failed.

for Better Machinability in **GRAY IRON CASTINGS**

Casting users profit from use of Nisiloy . . . a new, powerful, positive inoculant that promotes better machinability. It contains about 60 per cent nickel, 30 per cent silicon, balance essentially iron.

Faster, easier, lower-cost finishing of gray iron castings may be attained because Nisiloy serves to eliminate localized hard areas or chilled (white) edges and surfaces . . . regardless of sharp variations in section thickness.

EMBLEM OF INCO SERVICE TRADE MARK

Get full information. Send for *your* free copy of a booklet that describes how the dense, gray, machinable structure secured with Nisiloy reduces machining time, tool wear, rejects and costs. Mail the coupon now.

*Trade-mark of the International Nickel Company, Inc.

The International Nickel Company, Inc.
Dept. A.M. 67 Wall Street, New York 5, N. Y.

Please send me your booklet entitled "NISILOY" for GRAY IRON CASTINGS.

Name.....*Title*.....

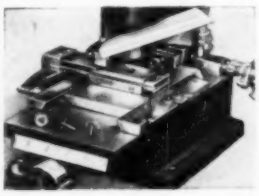
Company.....

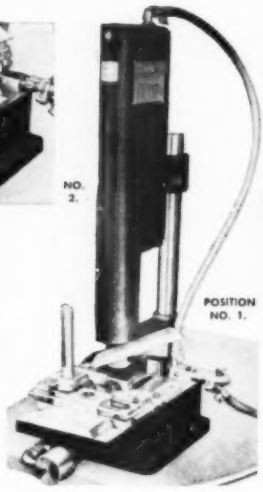
Address.....

City.....*State*.....

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

HOW TO STAKE 2500 AXLES PER HOUR TO GEARS...





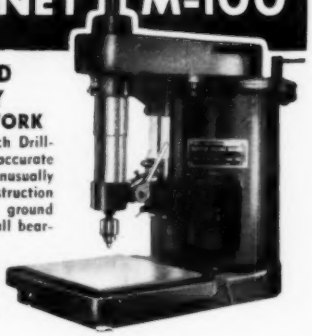
Vertical hopper moves forward on dovetailed slide to work station, releasing hammer blow. Spring-return motion ejects assembled parts through diagonal chute. Complete cycle follows one touch of foot valve. Write for full facts on Air Impact Hammers.

CATALOG READY

Send for copy of our new Air Power Catalog illustrating, describing many new man-and-money-saving devices.

MEAD
SPECIALTIES COMPANY
4114 NO. KNOX AVE., DEPT. MA-19 CHICAGO 41, ILL.

SIGOURNEY M-100



MAINTAINED ACCURACY IN PRECISION WORK

The Sigourney M-100 Bench Drilling Machine is extremely accurate on precision jobs. It is unusually sturdy and rigid in construction . . . has hardened and ground spindles . . . and sealed ball bearings throughout. All moving parts are entirely closed for maximum operator safety. M-100 is built for long and steady service.

This sturdily constructed bench drilling machine is available in 1, 2, 3, and 4 spindle models . . . speeds from 4,000 to 10,000 r.p.m.

Send for Illustrated Bulletin

THE SIGOURNEY TOOL CO.
Hartford 6, Conn.

Sole Sales Agents
PRATT & WHITNEY
Division Niles-Bement-Pond Co. West Hartford, Connecticut

How to Work **MAGNESIUM ALLOYS**

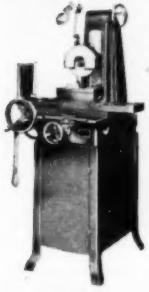
MACHINING... CASTING & FORGING
JOINING ... CLEANING & FINISHING
CHARACTERISTICS... SHEET WORKING

of this light-weight metal are thoroughly covered in *American Machinist's* special 16-page report, "How to Work Magnesium Alloys." Reprints are available at 10 cents per copy, postpaid. Order them today, while the supply lasts.

Ask for complete list of reprints in this series

READERS SERVICE DEPARTMENT
American Machinist
330 West 42nd Street • New York 18, N. Y.

MATTISON GRINDER SAVES TIME BY GRINDING V AND FLAT WAYS WITH SAME WHEEL ON SPECIAL FIXTURE



Practically all finished surfaces of the No. 612 **Boyar-Schultz** grinder shown at left are ground on the Mattison High-Powered Precision Surface Grinder.

Write for Free Set-Up Book showing how others have reduced time and cut costs with Mattison Grinders.

The illustration above shows a Mattison High Powered Precision Surface Grinder in the plant of **Boyar-Schultz** Corp. finishing V Ways of grinder table to precise accuracy and a fine finish. Work is held in special indexing fixture so that V and flat ways are ground with periphery of a standard grinding wheel. Considerable time is saved as no time is required for changing wheels, bevel dressing, etc. The scraping operation is eliminated. Surfaces of ways are finished parallel and flat to within .0002.

The bottom of table is ground on another fixture with similar results. Other parts finished include base-cover plates, columns, cross feed carriage, etc.

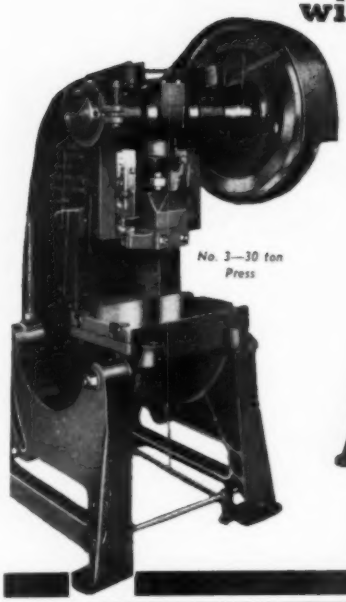
Here is an example showing how costs can be reduced through the use of the Mattison Grinder. For further examples ask for a free copy of the Mattison Set-Up Book.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

Greater Safety at No Extra Cost

with PRESS-RITE PUNCH PRESSES



No. 3—30 ton Press

No. 12—12 ton Press

- **Greater Safety for the OPERATOR**
- **Greater Safety for the DIES**
- **Greater Safety for the PRESS**

With the addition of the new No. 12 12 Ton Press and many improvements to the PRESS-RITE PRESS line, no greater combination of features has ever been offered that will provide such great safety to the operator . . . dies . . . and press. And you get this safety without added cost!

Already known for performance that increases production, and lowers operating costs, the PRESS-RITE Presses now include such outstanding advantages as

1. Built-in single stroke non-repeat mechanism with new 4 point contact steel clutch.
2. New patented automatic cam operated brake.
3. Anti-friction roller bearings in flywheel.

PLUS large die clearances, frame reenforcements, triple lubrication of ram ways, and many others.

Investigate PRESS-RITE PRESSES today. Six models from 5 to 30 TON capacity give you increased production . . . lower costs . . . plus GREATER SAFETY!

See your local dealer or write Dept. 138 today.

Sales Service Machine Tool Co.
2363 UNIVERSITY AVE ST PAUL 4, MINNESOTA

WANTED FOR DIVERSIFICATION

- **MECHANICAL PROCESSING MACHINERY OF PRECISION TYPE**
- **MECHANICAL EQUIPMENT EMBODYING PRECISION GEARING OR CAMS**
- **SPECIAL-PURPOSE MACHINE TOOLS**
- **MAJOR COMPONENTS OF MECHANICAL EQUIPMENT**

Our client, a well established manufacturer of medium size automatic machinery, will buy a business based on such products or will buy manufacturing rights for products fully engineered and market proven—sales volume in one or more lines up to two million dollars annually.

Interested in retaining competent executive, engineering and sales personnel.

Would consider contract manufacture looking toward ultimate merger.

Please write Department "B-4" enclosing this ad. Your reply will be held in confidence if desired.

We are fully compensated by our client.

CHARLES H. WELLING & CO., INC.
52 Vanderbilt Avenue, New York 17, N. Y.

Consultants in New Product Development

You should know MORE about FULMER HONING MACHINES

Fulmer Model 412
⅛"-4" honing capacity

. . . to get high speed accuracy on finishing **all types of cylindrical bores from ½" to 30" diam.** Fulmer Honing Machines remove stock **faster,** more **economically,** with **greater** accuracy, than **any other method.** Rugged in construction, simple to operate, Fulmer Honing Machines give maximum production with minimum investment.

★ **WRITE FOR NEW HONING BULLETIN, fully illustrated.** Gives valuable information on honing applications, **Alexander Ball** tools, and specification details on all models of Fulmer Honing Machines.

HONING TOOLS NOW AVAILABLE!

The **Alexander Ball** line of honing tools is now distributed exclusively in the United States by C. Allen Fulmer Co. Available in sizes from ½" to 50" diam. In many sizes of these tools, removable flanges are available in 1" or 3" increments of diameter. The same stone holders and basic tool are used. With **Alexander Ball** Tools the investment is very low where a wide range of diameters are honed. Write for complete details and prices.

C. ALLEN FULMER CO. 1234 First National Bank Bldg. CINCINNATI 2, OHIO

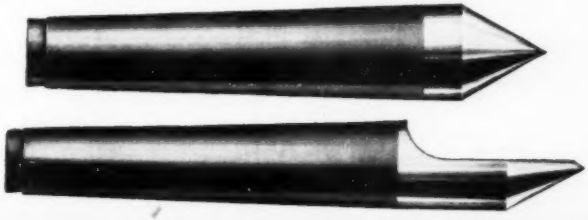
M-40-U *wear-resistant*

LASTS 3 TO 10 TIMES LONGER ON TOUGH JOBS

STEP UP and meet "M-40-U"—the wear-resistant alloy that is setting new standards for long life and performance. Developed by the Gorham Tool Company expressly for use as a wear and abrasion resistant metal, "M-40-U" alloy lasts *3 to 10 times* longer than high speed steel and other alloy materials for centers. Actual tests prove it far superior on the most rugged jobs. No waiting for delivery: Standard "M-40-U" alloy tipped centers can be furnished immediately from stock. ★ ★ ★ If you need *special* centers, our engineering department will help design them to your specifications. Choose GORHAM "M-40-U" for top performance and long wear.

GORHAM TOOL COMPANY

14400 WOODROW WILSON, DETROIT 3, MICH.



GORHAM

M-40-U ALLOY CENTERS

It cuts off minutes as well as metal-

the JOHNSON
metal cut-off BAND SAW

The Model J Johnson — the cut-off tool that's always busy in any shop.

Lock your stock in the vise, drop the saw to the work, throw the switch . . . and watch the non-stop endless blade of the JOHNSON shear down through the metal for a clean, fast, accurate cut-off job. . . . All controls at operator's finger-ends. Overall rigidity and extra-generous guide rolls help blades live long. Three-point suspension equalizes any floor.

TWO TYPES—Model J, a heavy sturdy tool cuts 10" rounds, 18" flats. Model B, lighter, portable, of rigid twistproof construction, cuts 5" rounds, 10" flats.

CATALOG for the asking Write—

JOHNSON
MANUFACTURING CORP.
628 CHRYSLER BUILDING
NEW YORK 17, N. Y.

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI 22, OHIO

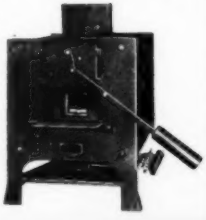
ABRASIVE
SURFACE GRINDERS
ABRASIVE MACHINE TOOL CO., EAST PROVIDENCE 14, R.I.
AGENTS IN PRINCIPAL CITIES

HYDRAULIC PRESSES
30 to 1,000 Ton—Built to Order
Write for illustrated catalog

M & N MACHINE TOOL WORKS, INC.
152 ORONO ST. CLIFTON, N. J.

BUZZER *Gas* FIRED FURNACES

2400° F. *Attainable Quickly Without Blower or Power*—just connect to your gas supply. Efficient and economical to operate. Temperatures easily controlled.

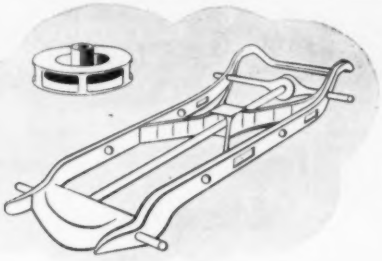


High Speed Full Muffle Furnaces designed for High Carbon and Alloy Steels. Also Semi-Muffle Furnaces for Low Carbon Steels, Preheating and Other Uses. Send for Catalog of Gas Furnaces, Burners, and other equipment.

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.

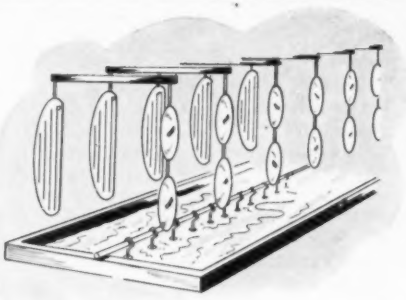
Clean all sizes of parts quickly, efficiently . . .

To clean any size or shape of part thoroughly . . . in one minute or less . . . in a single operation . . . it's Vapor Degreasing. Metals, glass and other materials are left clean of grease and oil, produced clean, warm and dry—ready for the next step.



And simplify handling and finishing

Cleaned parts are ready for inspection, assembly, further fabrication or finishing. Finishing rejects are minimized because solvent removes grease from deep draws, holes, almost inaccessible places. Risk of damage to delicate parts is reduced. Vapor Degreasing consumes only small quantities of solvent. Contaminated solvent is easily recovered for reuse.



Here's where you'll get the facts

This book tells how Vapor Degreasing simplifies production, how you can save time and cost in production, how the process can be used alone or as part of a flow line. It shows typical compact, modern equipment, which is available for efficient and economical operation. And it tells about solvents used in this equipment—Du Pont Trichlorethylene and Perchlorethylene—which under various trade names have been widely used for many years. Send for it today! Mail the coupon to E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Dept., Wilmington 98, Delaware.

DU PONT *Non-Flammable* **SOLVENTS for VAPOR DEGREASING**

SOLD NATIONALLY THROUGH DISTRIBUTORS

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Department
Wilmington 98, Delaware

Please send me my copy of "**Metal Degreasing—Standard Practices.**"

Name_____ Position_____

Firm_____

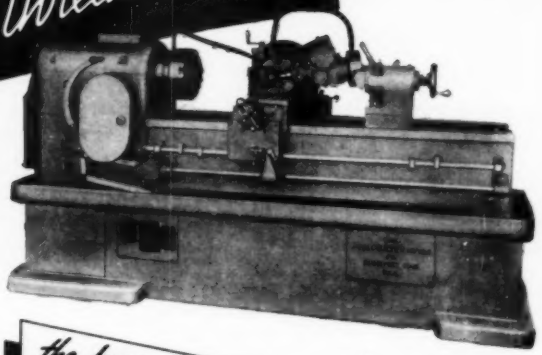
Address_____ State_____

City_____

Tune in to Du Pont "CAVALCADE OF AMERICA," Monday nights—NBC coast to coast.

ALWAYS OUTSTANDING
NOW IT'S
EVEN BETTER!

the Coulter
threadmaster



Check and Compare...

MORE DEPENDABLE Anti-friction bearings and spiral and worm gears in Cutter Spindle Drive.

MORE EFFICIENT Full size spindle and balance wheel on both ends of Cutter Spindle Drive.

MORE CAPACITY 59 speed changes possible with standard equipment. Cut threads from 1/3 to 20 per inch and diametral leads from 7 to 20 in single, double and triple worms, and leads from .050 to 3.000.

MORE PRODUCTION Mill hard and soft materials with carbide tools.

WRITE FOR PARTICULARS about the "THREADMASTER"... the Thread Milling Machine of tomorrow . . . threading it better and faster, today!

the James COULTER *Machine Co.*

The Thread Milling Machine that produces long and short precision traversing elevating, cross-feed and lead screws in LESS TIME!

BRIDGEPORT, CONNECTICUT

LELAND GIFFORD
PRODUCTION ENGINEERS
at these Branch Offices will help you with your
DRILLING PROBLEMS.

CHICAGO, ILL.
565 W. Washington Blvd.
DETROIT, MICH.
1533 Dime Bank Bldg.
CLEVELAND, O.
P. O. Box 5547
NEWARK, N. J.
Industrial Office Bldg.
ROCHESTER, N. Y.
Commerce Bldg.
WORCESTER, MASS.
for New England
LOS ANGELES 14, CAL.
724 South Spring Street

LELAND GIFFORD
WORCESTER 1, MASSACHUSETTS, U. S. A.

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE
Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

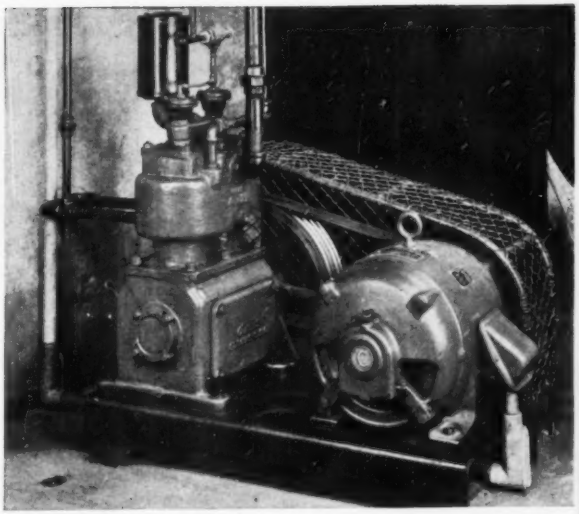
Severance **CARBIDE MIDGET MILLS**
Operate at grinding-wheel speeds
Outlast scores of mounted points
Cut 50 times faster
MANY SHAPES and SIZES
Cut hard materials - Rockwell 65-C
Write for Catalog No. 16
3/4 SIZE
May be REGROUND time-after-time by Severance—savings are thus multiplied
SEVERANCE TOOL INDUSTRIES, INC.
725 Iowa Ave., Saginaw, Michigan

PRESSES • FEEDS
AUTOMATIC EQUIPMENT
The VEO Press Company
HUDSON, NEW YORK

ACROMARK MAKES
ACROMARKER
NAME-PLATE AND PARTS STAMPING MACHINES.

OTHER PRODUCTS ARE — marking and numbering machines, steel stamps and dies, nameplates, metal signs, marking inks, porcelain enameled iron signs, badges, letter and design filling machines, engraving. Write to ACROMARK Company
7-13 MORRELL ST.
ELIZABETH 4, N. J.

Curtis Timken Bearing Air Compressor. Sizes from ¼ to 50 H. P., inclusive.



RELIABILITY
That Pays Off in Low-Cost Performance

CURTIS TIMKEN BEARING AIR COMPRESSORS

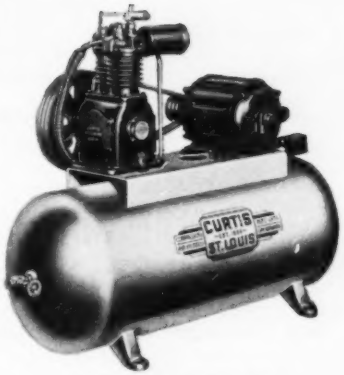
WHATEVER the application, in thousands of varied industrial installations, Curtis Timken Bearing Equipped Air Compressors have a long and proven record of extreme reliability, low maintenance expense and unusually long life.

Every Curtis Air Compressor has been carefully engineered, made of the highest quality materials and precision built throughout.

Their dependable, economical performance is the result of such design advantages as:

- Timken Roller Bearings
- Self-Oiling—Positive Lubrication
- Carbon-Free Disc Valves
- Automatic Pressure Unloader
- Fully Enclosed Design
- Precision Construction

Specify CURTIS when you want a reliable, low-cost supply of air for *any* use. Capacities from ¼ to 50 H.P. (up to 300 CFM).



Curtis Timken Bearing Air Compressor with tank. Sizes from ¼ to 10 H.P., inclusive.

Write today for full information on Curtis Air Compressors, Air Hoists and Air Cylinders—or mail the coupon below.

I-48-1

CURTIS

PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1924 Kienlen Avenue • • St. Louis 20, Missouri

95 Years of Precision Manufacturing

CURTIS PNEUMATIC MACHINERY DIVISION *of Curtis Manufacturing Company*
1924 Kienlen Avenue, St. Louis 20, Missouri

Please send me Form C-7 on Curtis Air Hoists, Air Cylinders and Curtis Air Compressors.

Name.....
Firm.....
Address.....
City..... Zone..... State.....

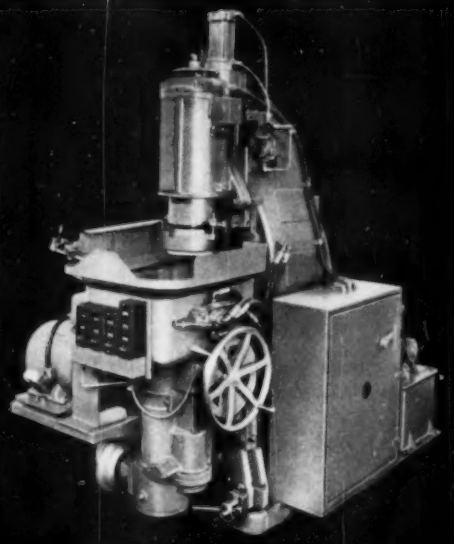
Walker High Production Vertical Grinder —the only Grinder of its kind and does not compete with other Grinders.

Specially designed primarily for the Saw and Circular Tool Industry.

Can grind *flats—convex—concave* and *bevels* to 15 degrees.

Has clearance for 8" hubs and can grind to a combination of radii giving a parabolic curvature.

Electric controlled—hydraulic feed—rapid traverse.



Walker Chucks

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

Walker Chucks

the "swing" is to

SPECIAL MACHINERY

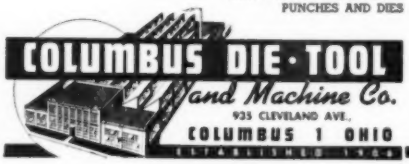
AND

the "orders" are going to—

"COLUMBUS DIE-TOOL"

Because we have specialized for years in designing and building single purpose machinery, our "know-how" is unequalled. WE HELP TO KEEP YOU AHEAD OF COMPETITION by designing the right machine for the job. Send us your machinery and tooling problems.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES



COLUMBUS DIE-TOOL & Machine Co.

935 CLEVELAND AVE.

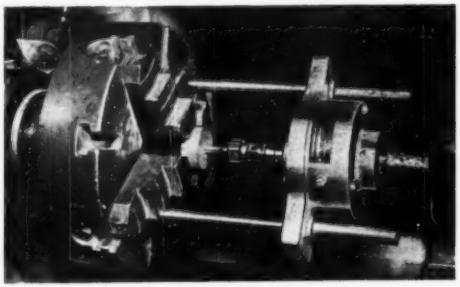
COLUMBUS 1 OHIO

ESTABLISHED 1905

HERE'S HOW:

TO TAP—and back out—

WITHOUT STOPPING THE WORK OR REVERSING THE MACHINE



The Errington Auto-Reverse Turret Lathe Tapping Head is a new tool, practical, time-saving, money-saving. In a turret lathe setup, as illustrated, it allows you to tap the hole and back out the tap without stopping the work or reversing the machine. It's easy to operate: you simply feed the tap into, and out of, the drilled hole while the work is turning in the one direction. The new Tapping Head is a money-saver in this respect, too: with the aid of a friction chuck, you can tap blind holes without any possibility of tap breakage.

Send for Complete Information

The ERRINGTON
AUTO-REVERSE
TURRET LATHE TAPPING HEAD

can also be used on drill press work for production-tapping. For this the Errington Head has a 2 to 1 reverse, and uses guide-bars to hold and steady the case.

Established 1891

ERRINGTON Mechanical Laboratory, Inc.

Main Office and Plant: STATEN ISLAND 4, NEW YORK

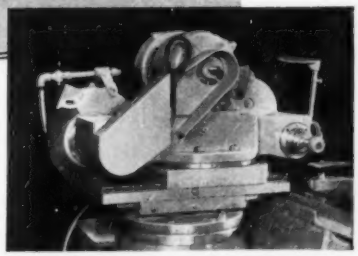
Cut "set-up" time
Slash toolroom grinding costs

with the *New* RIVETT 1024 TOOLROOM GRINDER

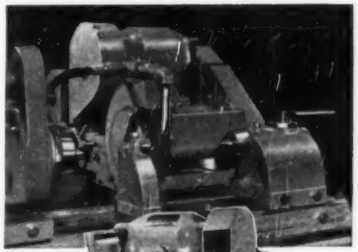
At long last! — a toolroom grinder that *does* something about "set-up" costs, far and away the most expensive item in toolroom and small lot grinding. On internal and external grinding work on straight, taper, two-angle, face and shoulder surfaces, Rivett 1024 has these *new* features to help you cut "set-up" time drastically:

1. **Double-end wheelhead** — Exclusive! Two spindles on swiveling workhead make possible rapid changes to internal or to external work. 2. **Hydraulic table reciprocation** — infinitely adjustable for speed and length of travel. 3. **Graduated swivel table and sine bar on workhead** — assure accurately measured tapers and angles. 4. **Optional work holding methods** — uses collets, step chucks, jaw chucks, plates, fixtures or "on-centers." 5. **Adjustable spindle speed** — internal from 6,000 to 35,000 r.p.m.; external 1800 or 2100 r.p.m.

And that's not all — the Rivett 1024 Grinder has been specially designed to extend the *range* of your grinding operations . . . double slides and swivels on cross slide increase possible "set-ups" *including double angles at one grind* . . . external wheel can be mounted on either end of spindle to permit face and shoulder grinding using periphery of wheel . . . positive table stop with micrometer adjustment positions work.



New! **Double-end wheelhead carries both internal and external spindles . . . swivels 180° to position *either* spindle. *Found only on the new Rivett 1024!***



CUT COSTS ON TOOLROOM GRINDING

Bulletin 1024 tells the whole story in pictures and helpful technical information. Write for your copy today.

RIVETT

RIVETT LATHE & GRINDER, INC.

BRIGHTON · BOSTON · MASSACHUSETTS · U. S. A.

IF YOU DESIGN,
MAKE or HEAT TREAT
TOOLS or DIES...

New! Completely Revised

GIVES YOU PRACTICAL
ANSWERS TO QUESTIONS SUCH AS...

"Which steel should I select for the job?" "How can I boost production per grind?" "How does design affect safety in heat treating?" "How can I avoid grinding checks?" "How long should a die be heated before quenching?" "What is the best furnace atmosphere for each steel?" . . . and hundreds more!

TOOL STEEL SIMPLIFIED

By Frank R. Palmer, *President* — George V. Luerssen, *Chief Metallurgist*
The Carpenter Steel Company
564 Pages 355 Illustrations
$2.00 Postpaid in U. S. A. $2.50 Elsewhere

564 pages of plain, practical information on how to get better tools and dies, lower costs, and more production from present equipment! 355 charts, diagrams, and photographs that clearly illustrate all important phases of tool and die making and heat treating! "Tool Steel Simplified", its 21 chapters completely revised, gives you practical answers that make your job easier and more valuable. Thousands of apprentices and skilled men responsible for the design, making or heat treating of tools and dies have profited by the first edition. The new, enlarged "Tool Steel Simplified" will be even more helpful to you! Yours at cost—order today as many copies as you need.

OVER 80,000 COPIES OF FIRST EDITION IN USE!

CLIP AND MAIL NOW!

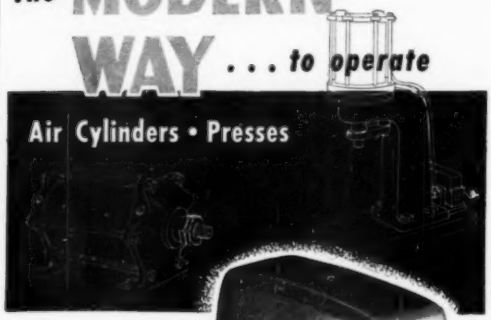
THE CARPENTER STEEL CO • READING, PA. • DEPT. 1A-2

Please send me, postpaid, your revised "Tool Steel Simplified". I enclose $2.00 ($2.50 outside U. S. A.) in full payment of the book.

Name _____ Title _____
Firm Name _____
Mailing Address _____
City _____ State _____
PLEASE PRINT

the MODERN WAY . . . to operate

Air Cylinders • Presses



NEW! ELECTRIC

DIRECTAIR

HANNIFIN • Air Control Valve!

SEE IT! TRY IT! You'll be amazed at the difference it makes when you use this new Hannifin push button operated air control valve. Without effort, a quick, full power stroke every time! No throttling possible; no short-stroking. Use it to boost production.

10 WATT SOLENOIDS — No pounding . . . no noise . . . no relays needed. Solenoids continuously rated; only momentary contact required. Speeds of 180 cycles per minute, or more!

PILOT TYPE — Remarkably simple! An exclusive Hannifin development. Thoroughly tested. Air pressure does the work with a double-acting piston that operates stainless steel reciprocating disc. No packing or seals to maintain.

NO PACKING TROUBLES — Metal-to-metal lapped valve seat. Long life; little or no maintenance. Remarkably compact. Strikingly styled.

TO MEET YOUR REQUIREMENTS — Type I: Fingertip control of advance and return cylinder strokes through two push buttons. Type II: Single push button control; equivalent to spring return valve action. 3-way or 4-way types. Ideal for remote control . . . building into equipment. Sizes ⅜", ½", and ¾". For any pressure from 25 to 150 p.s.i. WRITE FOR DESCRIPTIVE LITERATURE.

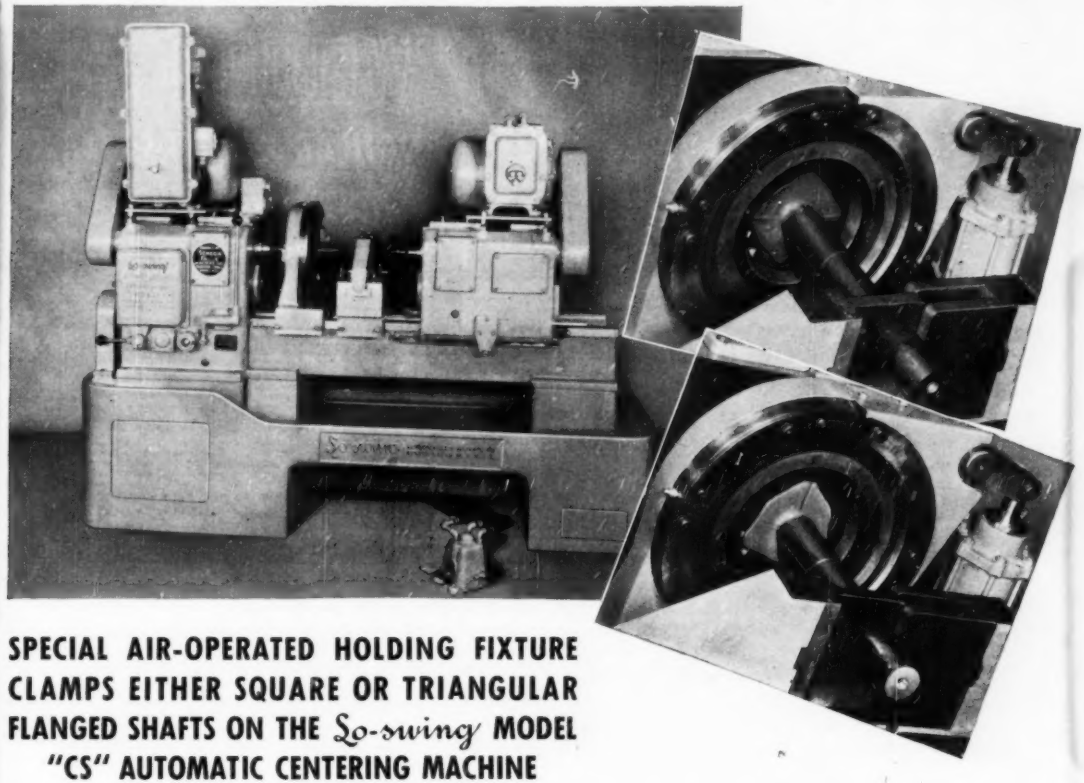
HANNIFIN CORPORATION

Nationwide Sales and Service

1101 So. Kilbourn Avenue Chicago 24, Illinois

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



SPECIAL AIR-OPERATED HOLDING FIXTURE CLAMPS EITHER SQUARE OR TRIANGULAR FLANGED SHAFTS ON THE Lo-swing MODEL "CS" AUTOMATIC CENTERING MACHINE

Problem: To automatically center two types of forgings true with outside surfaces on square and triangular flanged shafts, *without changing holding fixtures.*

Solution: The Model "CS" Automatic Drilling and Centering Machine selected for this job, was equipped with an air operated four jaw holding fixture specially designed to clamp either the square or triangular shaped flanged shafts shown in the upper right-hand illustrations. Centering from the outside surfaces of the flanges was important due to subsequent machining operations.

The top illustration shows the clamping of the square flanged shaft with two opposed jaws, while the other two jaws are clear of the work. The stem end of the shaft is held and centered in a standard air operated vise. The lower illustration shows the clamping of the triangular flanged shaft with three equally spaced jaws while the fourth jaw is clear of the work.

The machine design is 100% mechanical and its operation entirely automatic. The operator simply loads the parts in the holding fixture and steps on the foot control valve which operates both holding fixtures. The machine cycle is started with the lever mounted on the fixed centering head; the drill spindles advance to the work in rapid traverse, slow down for feed and then return to the starting position in rapid traverse.

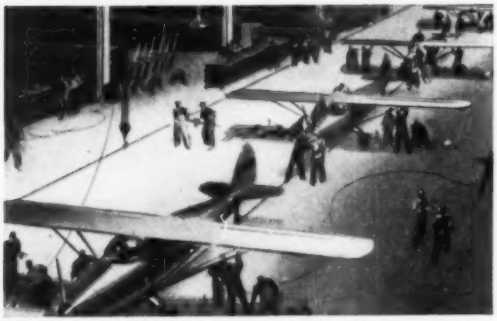
Both types of shafts have the same overall length and the operator may center either type of shaft as these reach the machine *without making adjustments of any kind.*

Engineered jobs are our specialty and our staff is at your disposal to assist in solving your problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

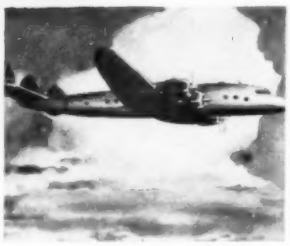
Seven new planes completed at a cost of $4.30!



New planes can't fly without control cable, and this manufacturer needed some—fast. He got it the same way he regularly gets many supplies and parts—by Air Express. Ordered in A.M., delivered to plant same day. 500 miles, 28 lbs., Air Express charge only $4.30. So production continued without a break.

$4.30 included pick-up and delivery at no extra charge—and receipt for shipment. All this, plus the *world's fastest shipping service.* That's Air Express—used with profit by every business.

Shipments go on all flights of Scheduled Airlines. Speeds up to 5 miles a minute—no waiting around. Direct service to over 1,000 airport cities, air-rail for 22,000 off-airline offices.



Facts on low Air Express rates:

22 lbs. of new fashions goes 700 miles for $4.73.
6-lb. carton of new jewelry line goes 1,000 miles for $2.24.
Same day delivery in both cases if you *ship early.*

Only Air Express gives you all these advantages: Special pick-up and delivery *at no extra cost. You get a receipt for every shipment* and delivery is proved by signature of consignee. One-carrier responsibility. Assured protection, too—valuation coverage up to $50 without extra charge. Practically no limitation on size or weight. For fast shipping action, phone Air Express Division, Railway Express Agency. And specify "Air Express delivery" on orders.

SPECIFY AIR EXPRESS
GETS THERE FIRST

Rates include pick-up and delivery door to door in all principal towns and cities

AIR EXPRESS, A SERVICE OF RAILWAY EXPRESS AGENCY AND THE
SCHEDULED AIRLINES OF THE U.S.

YESTERDAY'S PIONEER . . . TODAY'S LEADER

● For cutting dovetails and similar work these angular cutters are indispensable for the tool room and a great convenience in other milling departments. Set up time as compared with use of arbor type cutters is greatly reduced. Obviously they are truer running than the threaded hole type of cutters. Recommended for use in Weldon holders but may be readily used in collets. Just what you have always needed to save time and cut production costs. Furnished in 60° angle and right hand cut. They are stock items.

Write for Circular ACH-1

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

CONTRACT WORK

TOOLS • DIES • JIGS • FIXTURES • MOLDS • STAMPINGS • FORGINGS • SPECIAL MACHINERY • DEVICES • PARTS • SCREW MACHINE PRODUCTS • CASTINGS

F. F. SLOCOMB CORPORATION
Wilmington 99, Delaware

Builders of Special Machines a Specialty. Facilities Available for Production. Quantities of Small and Medium Precision Parts.

Equipment List on Request

GREY IRON CASTINGS

Fine quality grey iron castings small and medium size (1 lb. to 100 lbs.) made from your patterns or prints.

ELKIN FOUNDRY
Blue Spring St. Huntsville, Ala.

Put Your Idle Capacity to Work

Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of **American Machinist**—about your facilities. Write for rates.

CONTRACT WORK DEPARTMENT
AMERICAN MACHINIST
330 W. 42nd St., N. Y. 18, N. Y.

The Lowest Possible Die Cost For...

STAMPINGS

IN SMALL LOTS

DAYTON ROGERS MFG. CO.
Minneapolis 7, Minnesota

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us — we will take care of them!
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

KAMIS Engineering Company

Designers & Manufacturers of Tools & Machinery

Special machine work; facilities available for production quantities of small, medium and large machined parts, assemblies and fabrications. Specializing in stainless steel aviation gas turbine parts.

Send for Brochure No. 3 which describes our facilities in detail.

300 MOORE STREET
PHILADELPHIA 48, PA.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

DISPLAYED RATE

(Not available for equipment advertising)

90¢ per line, minimum 4 lines. To figure advance payment count 5 average words as a line.

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS, 90 cents a line an insertion.

INFORMATION

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

The advertising rate is $9.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.

NEW ADVERTISING received by 10 A. M. January 11th will appear in the issue of January 27th subject to limitation of space available

PRODUCTION MANAGER

Age to 40. Prefer graduate engineer for old established manufacturer of drills and reamers. Should be experienced and qualified to supervise production, planning, scheduling, time study and know operations. Forward complete resume and photo. Salary approximately $9,000.

GENERAL EMPLOYMENT SERVICE
440 The Arcade Cleveland 14, Ohio

POSITION VACANT

TOOL DESIGNER—Chattanooga. Should have minimum of five years experience with single and multiple spindle screw machine tools. Some jig and fixture experience also desirable. Write full details of qualifications. Enclose photo (non-returnable). P-7142, American Machinist.

SELLING OPPORTUNITIES OFFERED

WANTED A person with connections, who can secure work for old established manufacturers of special machinery and tools. Also have own wood or metal pattern shop. Commission or share of profits without investments. RW-7178, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service. 39 years recognized standing and reputation. The procedure of highest ethical standards is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 266 Dun Bldg., Buffalo 2, N. Y.

PATENT ATTORNEY

Patent Practice

before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel, Registered Patent Attorneys. Suite 453, 815-15th Street, N. W. Washington 5, D. C.

REPLIES (Box No.):
Address to office nearest you.
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

WANTED

WANTED

1—20 to 25' Boring Mill.
1—8' Vertical—11' Horizontal Planer Type Mill.
1—8' Radial Drill.
1—50 ton 75' span Crane.

W-7283, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

10' x ½" press brake
8' x ½" gate shear

Cincinnati or equivalent
State price and delivery

W-7373, AMERICAN MACHINIST
68 Post St., San Francisco 4, Calif.

PUBLIC AUCTION SALE

BY ORDER OF BOARD OF DIRECTORS

$750,000 OFFERING

EXTREMELY MODERN MACHINERY & EQUIPMENT

of the STANDARD MACHINERY CO.

on the premises: 1475 ELMWOOD AVE., Providence, R. I.

SALE DATE: WEDNESDAY, JAN. 26, '49

at 10 A.M., Continuing Until All Lots Are Sold.
Inspection: Jan. 22 to Sale Date.

MANY MACHINES PURCHASED NEW 1942-1944, Comprising:

BORING MILLS: Vertical; 74" Bullard Cutmaster; (2) 54" & (1) 42" Bullards, all spiral drive; 36" Bullard New Era. HORIZONTAL; 5" Bar #350T Giddings & Lewis; (2) 3" Bar Universals; 2½" Bar Cleveland, all table type.

LATHES: ENGINE: from 9"x36" to 22"x12' mostly Geared Head, Timken Bearing, including Lodge & Shipley; Axelson; Reed Prentice; Hendey; South Bend. TURRET: 16" Bullard Mult-Au-Matic Type "D" 8-spindle Vertical Turret Lathe; (2) 2L Gisholts High Production Hydraulic Universal; 3 AL Gisholt; #4 Warner & Swasey, Preselector Head; 3¼"x36" Acme; 3"x36" J & L Steel Head.

MILLING MACHINES: PLAIN; #4K, #2HL Milwaukee's Knee Type; (4) #4B (2) #3B (1) #2B Brown & Sharpe; UNIVERSAL; #4K Milwaukee Knee Type; #3B Milwaukee; #2 Osterlein. VERTICAL; #4K Milwaukee Knee Type; (2) Bridgeports; ALSO #00 Sundstrand Rigidmill; 8" Taylor & Fenn Duplex Spline Miller.

RADIAL & UPRIGHT DRILLS; RADIAL; 3' & 4' Carltons, motor on arm, 11" col.; 4' Fosdick, enclosed head, 13" col.; 4' American; 5' Reed Prentice; UPRIGHT; 25" Fosdick Economax; 21" Cinn. Super Service 28" Leland Gifford; #2 Avey Matic; #2 Avey 2-spindle; 4-spindle Providence; (4) 3-spindle Prentice.

GRINDERS: SURFACE; 14"x16"x60" Mattison, Hyd.; 10"x36" Norton, Hyd.; A3-16 Arter; (2) #2 B & S; #3B Abrasive. PLAIN CYLINDRICAL; from 10"x36" to 16"x96" Cinn., Landis, Norton, B&S; INTERNAL, RADIUS & HOLE; 72A Heald; #16Y2B Bryant Hyd.; #647 Van Norman Radius; #174 Heald Gap Internal. CENTERLESS, CHUCKING, BALL RACE & UNIVERSAL; #4 Cinn. Centerless, Filmatic Bearing; (2) #12 Bryant Chuckers; (2) #3½T Van Norman Auto. Ball Race; (3) #2 B & S Universals: Also; Sellers, Delta, Hisey Wolf Tool & Cutter.

GEAR CUTTERS, SHAPERS, PLANERS: 8A & 7A Fellows Gear Shapers; 32" Ohio Shaper P.R.T. Planers from 24"x24"x8' to 60"x 60"x14' Pond; and Gray.

PRESSES: New 6B Standard O.B.I. 100 ton cap. 3" stroke; #5½BB, #8S, #5B, #10, #5½S Standard; also Manville & Greenard Bench & Arbor Presses.

ADDITIONAL MACH.: V-16 Do-All; 18" Atkins; 14" Robertson; 6x6 Racine; 12" Barnes Cold Saws. #1 & #3 Mitts & Merrill and Baker Keyseaters. #3U Gorton Pantograph. Type 3L LaPointe Broach. #1R Bakewell Dual Radius Tapper, Campbell Nibbler. Die Filers. Woodworking Machines such as Band Saws, Planers, Saw Tables, etc. (2) 4¼", 3¼" & (2) 7/8" Gridley Single Spindle Automatics. Brand New 258 Cu. Ft. Ingersoll Rand Air Compressor. American & Lindberg Gas Fired Heat Treating & Tempering Furnaces.

Large Tool Crib, Inspection Department, Office Furniture & Machinery, Factory Supplies.

App. 65,000 lbs. New Brass Strips Incoil, 2", 2¼" & 2½" wide; App. 5,500 lbs. .132" New Brass Rivet Wire.

FREE Detailed Descriptive Circular Sent on Request FREE DO IT NOW! Write Wire Phone DO IT NOW!

INDUSTRIAL PLANTS CORPORATION

AUCTIONEERS, APPRAISERS, LIQUIDATORS

90 W. BROADWAY, N. Y. 7 — BARCLAY 7-4185 — CHICAGO, TOLEDO, DETROIT

PLANERS

48"x48"x12' Cincinnati Rapid Traverse, 4 heads

36"x36"x12' Woodward & Powell, 4 heads

32"x32"x10' Whitcomb, 2 heads

24"x24"x10' Whitcomb, 2 heads

Older Type machines, in excellent condition

HAZARD BROWNELL

350 Waterman St., Providence 6, R.I.

Dexter 8880

LATE PRODUCTION MILLERS

2—1942 Brown & Sharpe #12, 18-inch automatics, 440 vol., 3 phase, 60 cycle. Transformers available for 220 vol. In excellent condition, all ready for production work at close tolerances. Less than half List Price.

Also Detrich & Harvey—open side planer, Bed 30"x10"—motorized.

HESSE MACHINE & MFG. CO., INC.

222 Quincy St. Boston 21, Mass.

DAVENPORTS

2—only 5 spindle Davenport model B 9/16" capacity in the high 1300 serial. Each machine is complete with spindle stopping attachment, stationary burring attachment, threading attachments, countersink arm, center drive and chip conveyor. 7½ H.P. 3 phase, 220-440 volts, 60 cycle motors. These machines are in excellent mechanical condition and can be tested under power.

1—only 5 spindle Davenport model B 9/16" capacity. Middle 900 serial complete with threading spindle, stationary burring attachment, 2 drill speeders, chip conveyor, 18 miscellaneous cams and two sets of collets and fingers. 7½ H.P. 220 volts, 3 phase, 60 cycle motor. This machine is in good operating condition.

F.S.-7490, AMERICAN MACHINIST

330 W. 42nd St., New York 18, N. Y.

"WALSH" PUNCH PRESSES

Size	Stroke	Delivery
6 Ton	1¼" or1½"	10 days
12 Ton	1½" or 2"	Immediate
18 Ton	2" x or 2½"	Immediate
20 Ton	2½" or 3"	Immediate
24 Ton	2" or 2½"	Immediate
28 Ton	2½" or 3"	Immediate
38 Ton	3", 3½" or 4"	Immediate
55 Ton	3" or 3½"	Immediate
65 Ton	4" or 4½"	Immediate

All Presses Complete with Drive, Motor, Counting and Safety Devices. Roll Feeds For All Presses. Two Weeks Delivery. Time Payments Arranged. Exclusive Distributors.

SCHULTZ & ANDERSON CO.

115 Edison Place, Newark, New Jersey

Tel. MArket 2-4318

MACHINERY FOR SALE

Potter & Johnston 5 DE Machine
3 spindle Gould & Eberhardt 36B Rougher
10" D. E. Whiten Gear Cutter motorized & rebuilt by the manufacturer.
Lodge & Shipley Duomatic Lathe.

SIER-BATH GEAR PUMP & CO., INC.

9252 Hudson Boulevard, North Bergen, N. J.

FOR SALE

Oliver Template Tool Grinder with special tool holders, diamond dressing attachment, magnetic reversing starter, purchased 1941, slightly used. First reasonable offer takes.

CROBALT, INC.

BOX 631, ANN ARBOR, MICHIGAN

SHEET METAL MACHINERY

NEW and USED — HAND and POWER. Apron Brakes, Press Brakes, Shears Forming Rolls, Power Presses, Pittsburgh Lock Machines, Spinning Lathes, Spot Welders, etc.

MONA MEMBER

B. D. BROOKS, INC.

361 Alantic Ave., Boston 10, Mass.

POWER PRESSES

BLISS - TOLEDO - V & O - LTV
REBUILT — GUARANTEED

MBA MEMBER

JOSEPH **HYMAN** & SONS

Tioga, Livingston and Almond Streets
Philadelphia, Pa.

FOR SALE

Model 600 DeLaval Clarifier for $250.00 F.O.B. Our Plant—Not crated. Suitable for removing particles from water or liquids.

R. E. Worden, Dictaphone Corporation
375 Howard Ave., Bridgeport 5, Conn.

FOR SALE

One #5 Bardons & Oliver Universal Turret Lathe
One 2A Warner & Swasey Universal Turret Lathe

Would like to apply on trade for #5 Warner & Swasey Universal Turret Lathe, Serial above 857506-W.

Chowning Regulator Corporation

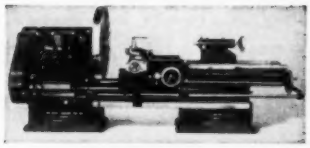
CORNING, N. Y.

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY

18 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented



Nebel 20"-40"x8' Geared Head Quick Change Gear Extension Bed Gap Lathe. 3/60/220 volts motor driven. Taper Attachment, faceplates, chuck, tailstock, plus Hexagon Turret with power feed. Immediate delivery.

ENGINE LATHES

36"x30' LeBlond Geared Hd. Motor Dr.
32"x16' Bridgeford, Geared Head, M. Dr.
28"x10' Davis Quick Change Gear
26"x18' Bridgeford, Geared Head, M. Dr.
25"x14' LeBlond Motorized
24"x18' American Q.C.G. Grd. Hd. 11' centers, Taper Attach. Motor Dr. Equipment
24"x14' Lodge & Shipley, Motorized
24"x16' American Motorized
24"x12' Putnam, Quick Change Gear
24"x10' LeBlond, Quick Change Gear
21"x18' LeBlond, Motorized
20"x11' Schumacher-Boye, Q.C.G.
20"x10' American, Q.C.G. 72" centers
20'x10' Hendey, Q.C.G. motor dr.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x10' American Geared Head
18"x8' Davis Q.C.G. 42" centers, equipment
18"x8' Lodge & Shipley, geared head
18"x8' Hendey Q.C.G. 49" centers
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, M.D.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Lodge & Shipley Geared Head
16"x6' Lodge & Shipley "Patent Head", Motor Dr.
16"x6' South Bend Enclosed Head, Motor driven. Taper Attachment, Chucks, Collets & Quick Acting Collet Chuck.
14½"x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, chucks, Turret Toolpost, Threading Dial, Ram Type Turret Attachment, collets & Collet Chuck.
14"x8' Rockford, Q.C.G. Collets
14"x6' LeBlond, Q.C.G. M. Drive
14"x6' Mulliner-Endlund, M. Drive
14"x6' Hendey, Q.C.G. M. Drive
14"x6' Rockford, Q.C.G. M. Drive
13"x5' South Bend Q.C.G. 30" centers
12"x30" American Wood Spinning
12"x5' Sidney, Geared Head
12"x5' Hendey Q.C.G. M. Drive
12"x5' Hendey Motorized. Taper & Collets.
12"x5' Sebastian Q.C.G. Grd. Hd.
12"x5' Mulliner Motorized. Taper Att.
12"x3' Craftsman, Bench, M. Drive
12"x18" Porter-Cable Carbo-Lathe
11"x4' Sidney, Q.C.G. Floor Type

TURRET LATHES

Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #601 Hand Screw Machine 1½" cap.
W-Swasey #4 Univ. 1¾" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed, 1½"
W-Swasey #3 Univ. 1¼" cap., M. Dr.
Gisholt #4 Univ. 2" cap., M. Dr.
W-Swasey #2A Univ. 2⅛" Cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap
W-Swasey #3A Univ. 3½" cap., M. Dr.

Buffalo #0 Bending Rolls. Pinch Type, motor driven. With formers for bending angles, rounds, squares, pipe.
Buffalo #1 Wrapping Rolls. Motor driven. Capacity—3½x3/8x9
Niagara Initial Type. 12'x⅛" capacity.

Porter-Cable 12"x18" Mechanical CARBO-LATHE. Semi-Automatic. 63 spindle speeds, 95 to 1130 r.p.m. Collet capacity —1". 3/60/220 volts motor drive.

GRINDING MACHINES

J & L #TG-615 Automatic Thread, M. Dr.
Norton 6x18 Vert. Surface, Excello Spindle
Norton 6x18 Horiz. Surface, Excello Spindle
Brown & Sharpe #2 Auto. Surface, 6x18
Pratt & Whitney 14x36 Vertical Surface
Blanchard #16, 30" Vertical Surface
Thompson Hydraulic Horiz. Surface
Abrasive Automatic Surface, 22x8
Reid #2 Automatic Surface, 6x18
Norton Hydraulic Horiz. 6x36
Heald #25 Rotary Surface
New Leach 6x12 Horiz. Surface, 3/60/220 volts
Brown & Sharpe #2 Face, motorized
Rivet #3 Internal, Cone driven
Heald #70 Internal, Belt drive
Heald #60 Internal, Belt drive
Norton #2 Univ. Tool & Cutter, Belt Dr.
Cincinnati #1½ Univ. Tool & Cutter, Belt Dr.
Oakley #3 Tool & Cutter, Belt Dr.
G & Livingston #4 Tool & Cutter
Cincinnati #2 Tool & Cutter, M. Dr.
Cincinnati "Monoset" Tool & Cutter
Cincinnati #2 Centerless, M. Dr.
Gorton Dble. End Disc, 18" dia. discs
Besley Dbl. End Disc, 30" dia. discs
Greenfield #12 Internal Hydraulic
Cincinnati #2 Univ., Cylindrical 6x36
Brown & Sharpe #10 Cylindrical 6x18
Brown & Sharpe #11 Cylindrical 10x30
Brown & Sharpe #4 Univ. Cylindrical 12x60
Brown & Sharpe #5 Plain Cylindrical
Oliver of Adrian #51 Drill Grinders

AUTOMATICS

No. 0 & No. 00 Brown & Sharpe
No. 0 Brown & Sharpe Automatic Cutoff #2 Brown & Sharpe High Speed Automatic. Turner Drive.
1—1¼" Cone 4-spindle Automatic M.D. Threading Spindle
Cleveland Model "A" 3¾" Single Spindle. Motor driven.

PUNCH PRESSES

Caldwell 200 tons Horiz. Hydr. Wheel Press.
Niles Bement & Pond Horiz. Hydraulic Wheel Press.
Bliss #18, #20, #20B, #21 O.B.I. Motorized.
NEW—Gemco 20" Universal Shaper. M. Dr.
Ferracute #86 Wide Frame, motor driven. 6¼" between housings. 1¾" stroke.
Ferracute No. EG52 Coining Press. 150 tons.
General Flexible Power Press. 8 tons, M. Dr.
Michigan O.B.I. 36 tons cap. 2" stroke. Wide Ram, wide Bed. Motor driven
Bliss No. 68C Dbl. Action, Gap Frame.
Lucas 15 tons, Power Arbor Press. M. Dr.
Hub O.B.I. 15 tons, 2" stroke, M. Dr.
Tompkins & Johnson Power Arbor Press.
McCall No. 4 O.B.I. 2½" stroke, 25 tons.
NEW Johnson O.B.I. Presses. All sizes.
Bliss #305 Geared S.S. Single Action
Nilson 56 tons S.S. Dbl. Crank 3-Die Transfer Press
Rousselle #15 Horn Press. Motor Driven

SHEARS

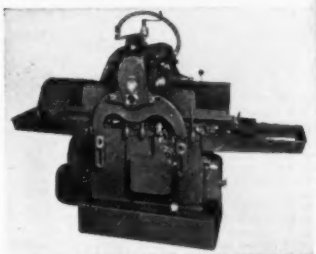
Bliss #109 Slitter, 10 ga. cap.
Pexto #571 Slitter, 3/16" cap.
Wais & Roos 10' x ¼", 15' gap.
NEW Famco 36"x18 ga. Squaring
Pexto Foot squaring 30" x 22 ga.

GEAR CUTTERS

Fellows #72 High Speed Gear Shaper, Internal & external, Motor driven
Fellows #7 High Speed Gear Shaper, External, Motor driven
Brown & Sharpe #3—36 Automatic Gear Cutter, 36" dia. Motor driven
Brown & Sharpe #34 Gear Hobber. 5" dia. Motor driven
Barber-Colman #3 Gear Hobber, 5" dia. 7" face, Motor driven
Whiton #1 Automatic Gear Cutter, 34" dia. 7" face, Motor driven
Adams #1 Gear Hobber, 14" dia. 6" face, Motor driven

MILLING MACHINES

Vernon #0 Hand, Late Type, M.D.
Nichols Hand, Late Type, M.D.
Sundstrand #0 Rigidmil, M.D.
Whitney #6 Hand, Cone Drive
Hardinge B.B. Vertical, Bench
Bickett #1 B.B. Vertical, Bench
Ames Universal Horiz. Bench
Becker #5C Vertical, Cone Dr.
Knight #1½C Vertical
Cincinnati #3 & #4 Vertical
Cincinnati #2 Univ. Horizontal
Cincinnati #3S Univ., Horizontal
Cincinnati #3, #4, #5 Pl. Horiz.
Cincinnati #2M Univ. Horiz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom
Brown & Sharpe #0, 1, 1Y Horizontal
Brown & Sharpe #2 Univ. Horiz.
Brown & Sharpe #1D Univ. Horiz.
Brown & Sharpe #3 Univ. Horiz.
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain
Milwaukee #2K Vertical, M. Dr.
Milwaukee #3K Vertical, M. Dr.
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #2B Universal Horiz.
Milwaukee #3B Plain Horizontal
Pratt & Whitney #2 Duplex, Motorized
Van Norman #2 Duplex, Motorized
Cincinnati #0-8 Vertical, M. Dr.
Cincinnati #0-8 Plain Automatic
Cincinnati #0-8 Rise & Fall
Cincinnati #2-18 Plain Automatic



Cincinnati #2-18 Automatic Horizontal Milling Machine. Late Type, Motor driven with motor and controls. Motor driven coolant system. NINE AVAILABLE.

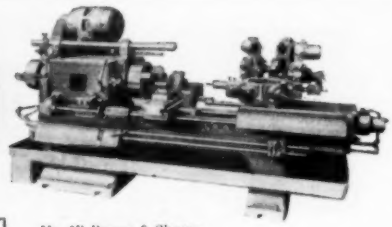
SHAPERS & PLANERS

Shaper—Logan 7" Horizontal. NEW
Shaper—Machinery Sales 16", motorized
Shaper—Gould & Eberhardt 16", motorized
Shaper—Smith & Mills 16", motorized
Shaper—Smith & Mills 16" Universal
Shaper—Potter & Johnston 16", Universal
Shaper—Gould & Eberhardt 18" B.G. Crank
Shaper—American 24" crank, motorized
Shaper—Columbia 32" B.G. Crank. Gearbox
Planer—Whitcombe 24x24x6 motorized
Planer—Shaper—Niles-B. Pond 20x20x24
Planer—Betts 72x60x30 Modern 4-Head
Planer—Betts 72x60x25 Modern 4-Head
Planer—Betts 122x72x34 Modern 4-Head

DRILLING MACHINES

American 8' Triple Purpose Radial, M. Dr.
Cinci-Bickford 6' Arm, 15" col. Radial
Cinci-Bickford 5' Arm, 13" col. Radial
American 4' Triple Purpose Radial, M. Dr.
Fosdick 5" Arm 14" col. Radial
Demco 4-Spindle Drill #2 M. T. M. Dr.
Natco #12, 20 Spdle. Multiple, 3/16" cap
Minster #20 Single Spindle Upright Heavy Duty 2½" cap. Compound Table. Motorized
Canedy-Otto 21" Single Spdle. Late Type
Cinci-Bickford 21" Drilling & Tapping, #3 m.t.
Buffalo Forge #2MS Drill. Late Type
Barnes 22" Backgeared Upright Single Spdle.
Leland-Gifford #2MS, 2-Spindle Upright
Edlund #2B, 4-Spindle Upright, #2 m.t.
NEW Buffalo Forge #15, #18 Single Spdles

MODERN
used and rebuilt
MACHINE TOOLS



AUTOMATICS
Bullard Mult-Au-Matic, 6 spdl. Model D. 1941.
6" Conomatic, 4 spindle. 1943.
6" Goss & DeLeeuw Chucker, 8 spdl. 1943.
9/16" RA-6 Gridley. 1943.
9/16" RA-6 Acme Gridley Chucker. 1942.
No. 60 New Britain, 6 spindle. 1942.
Model 3-8 Cecco. Late.

BORING MACHINES
3" Yoder Boring Mill. 1942.
No. 49 Heald "Bore-Matic". 1942.
No. 47A Heald "Bore-Matic". 1942.
No. 2112A Excello. 1943.

BROACHES
No. CPC 6-30 LaPointe Vert. 1941.
No. V—1½ American Vertical. Late.
40 Ton LaPointe Vert. 66" stroke. Late.

DRILLS, HEAVY DUTY
No. H3 Barnes Vert. Hydram. 1942.
25" Fosdick Economax. 1941.
24" Sibley Sliding Head. 1942.
No. 3 Bausch Multiple Spindle.
Fox Multiple Spindle. 1944.
Barnes 2 Spindle Deep Hole. 1943.
No. ½ B P & W Deep Hole. Late.
No. ½ B P & W Reamer. Late.
No. ½ B P & W Hyd. Rifler. Late.

DRILLS, RADIAL
6' 17" Carlton. 1942.
3' 9" Dreses. Late.
20" Pfiffner Drillmaster. 1942.

DRILLS, SENSITIVE
20" Walker Turner 6 Spindle. 1942.
No. KH2 Allen, 6 Spindle. 1943.
16" Atlas, 4 Spindle. 1942.
15" Atlas, 4 Spindle. 1942.
14" Delta. 4 Spindle. 1942.
No. 2 Motor Avey, 4 Spindle. 1943.
No. 2 MS Allen, 1 to 3 Spindle. 1942.
No. 2 Motor-Avey, 3 Spindle. 1942.
No. 2B-8 Edlund, single spindle. 1942.
No. 2 Hamilton-Muehlmat. 1943.
Leland-Gifford, Single Spindle. 1942.

GEAR EQUIPMENT
No. 5 AC Lees Bradner Gear Gen. 1941.
No. 7A & 715 Fellows Gear Shaper. 1942.
No. 7125A Fellows Gear Shaper. 1943.
No. 615-A Fellows Gear Shaper. 1944.
No. LS Fellows Gear Lapper. Late.
No. 6 Gleason Tester. Late.
No. 12 Gleason Tool Sharpener. 1942.
Model GCL-3 Red Ring Gear Shaver. 1942.
15" Red Ring Gear Lapper. 1942.
Red Ring Universal Gear Checker. Late.
Type S Barber-Colman Hobber. 1942.
No. 140 Cleveland Hobber. 1942.
Vinco Spline & Gear Grinder. 1942.

GRINDERS, CYLINDRICAL
14"x36" Norton Type C Universal. 1943.
12"x48" Cincinnati Universal. 1943.
10"x24" Landis Type C Universal. 1942.
10"x18" Norton Type C Plain. 1942.
6"x30" Cincinnati Plain. 1943.
6"x18" Landis Type C Plain. 1941.
6"x18" Norton Type C. 1942.
4"x12" Landis Type H Plain. 1942.
No. 2 Brown & Sharpe. Late.
No. 5 Brown & Sharpe Plain. Late.
No. 2 & 3 Cincinnati Centerless. 1942.

GRINDERS, INTERNAL
No. 81 Healdt "Sizematic". Late.
No. 74 Heald Extended Bridge. 1941.
No. 75A Heald, two motor. 1943.

NO. 2 FU FOSTER FASTERMATIC UNIVERSAL SADDLE TYPE TURRET LATHE. Automatic cycle, 28 speeds (17 to 277 RPM). Timken bearing spindle, 8" flanged type spindle nose, 3" hole in spindle, 25¼" swing over ways, max. distance spindle nose to hex turret 50 3/16", with air chuck and cylinder, assorted tooling, coolant, motor and controls. New 1943.

No. 72A3 Heald Plain. 1942.
No. 72A5 Heald Plain. 1944.
No. 16 CP-16" Bryant. 1942.
No. 104 Rivett. 1942.

GRINDERS, SURFACE
16"x16"x48" Thompson, Type C. 1943.
14"x36" Pratt & Whitney Vertical. 1942.
6"x18" Robot. 1942.
72" Rogers Knife Grinder. Late.
No. 2B Reid. 1944.
No. 2C Reid. 1945.
No. 25A Heald Rotary. 1942.
No. 22 Heald Rotary. 1943.
6" Taft Pierce Rotary. Late.
A-18 Arter Rotary. 1942.

GRINDERS, TOOL & CUTTER
No. 2 Cincinnati Univ. 1941.
No. 13 Brown & Sharpe Univ.
No. 91A Covel Universal. 1942.
No. 22 Covel Universal. 1942.
No. 4T Sellers Carbide Tool. 1942.
No. 6G Sellers Drill Grinder. 1942.
Barber-Colman Combination. 1943.
No. 44, 48 & 49 Excello. 1942.
Milwaukee Face Mill. 1942.

LATHES, ENGINE
18"x54" Lodge & Shipley. 1943.
18"x54" Sidney. 1943.
18"x48" Bradford. 1942.
16"x8' South Bend c.d. 1944.
14"x7' South Bend c.d. 1943.
14"x54" Reed Prentice. 1942.
14"x30" Lodge & Shipley. 1943.
14"x6' Hendey.

LATHES, PRODUCTION
14"x42" Monarch "Magna-Matic." 1941.
9"x20" Lipe. 1942.
8"x36" Lo-Swing Semi-Auto. 1942.
8"x21" Fay Automatic. 1942.
Model 10 Sundstrand. 1942.
Model 8 Sundstrand. 1942.
Model IMP & R Lo-Swing. 1942.

LATHES, TURRET
No. 2A Warner & Swasey. 1942.
No. 1A Warner & Swasey. 1944.
No. 9A Jones & Lamson. 1942.
No. 1 Acme Universal. 1941.
8⅛"x24" Acme. 1943.
No. 3L Gisholt. Late.
No. 2L Gisholt. 1943.
No. 5 Warner & Swasey. 1941.
No. 4 Warner & Swasey. 1941.
No. 3 Warner & Swasey. 1943.
No. 2 Warner & Swasey. 1941.
No. 2, 5 & 7 Bardons & Oliver. 1941.
No. 3 & 4 Gisholt. 1943.
No. Midland. Late.

MILLING MACHINES, PLAIN
No. 3B Brown & Sharpe. 1941.
No. 2H Milwaukee. Late.
No. 2HL Milwaukee. 1942.
No. 2M Cincinnati.
No. 2B Brown & Sharpe.
No. 3 Van Norman. 1942.
Van Norman Hand Mill. 1942.

MILLING MACHINES, PRODUCTION
No. BL2420 P & W "Keller", 3 spindle. 1942.
No. BL2416 P & W "Keller", single spindle. 1943.
No. BG-1 P & W "Keller" single spindle. Late.
No. 34-36 Cincinnati "Hydromatic". 1942.
No. 3-36 Cincinnati "Hydromatic". 1943.
No. 1248 Milwaukee "Simplex". 1942.
No. 08 Cincinnati, Rise & Fall. 1942.
No. 2-18 Cincinnati, Rise & Fall. 1942.
No. 1-18 Cincinnati. 1942.
No. 12 Brown & Sharpe. 1942.
No. 1-14 Kent Owens. 1943.
No. 2-20 Kent Owens. 1942.
No. MM-1-5-2 U.S. Multi-Miller. 1943.
No. MM-1-6 U.S. Multi-Miller. 1942.
No. 0 & 2 Sundstrand. 1943.

MILLING MACHINES, THREAD
12"x54" Lees Bradner. Late.
8"x16" Hanson-Whitney. Late.
4½"x12" Pratt & Whitney. Late.
4"x9" Hanson-Whitney. Late.

MILLING MACHINES, UNIVERSAL
No. 2 SU Van Norman. 1942.
No. 2H Milwaukee. 1942.
No. 1 Cincinnati.

MILLING MACHINES, VERTICAL
No. 2 Milwaukee, Model D. 1945.
No. 3K Milwaukee. 1942.
No. 3H Milwaukee. 1940.
No. 2K Milwaukee. 1942.
No. 3 Cincinnati. 1942.
No. 2 Cincinnati. 1940.
No. 2 Milwaukee.
No. 1 Cleveland. 1942.

MISCELLANEOUS
10'x14 Ga. Chicago Press Brake. Late.
6'x½" Bertsch Bending Roll. Late.
No. 333 Chicago Press Brake. Late.
No. 405 Williams Turnings Crusher. 1943.
200 Lb. Bradley Helve Hammer. 1941.
No. 7B High Speed Riveting Hammer. 1942.
J & L Comparator. Late.
50KVA Federal Spot Welder. 1942.
Model MA Sunnen Hone. 1942.
No. 616 Cleveland Rigidturner.
No. 26 F Norton "Hyprolap". 1942.
No. 74 Excello Center Lapping Mach. 1942.
3' Leland Gifford Radial Tapper. 1941.
No. 1 Savage Roller Type Nibbler. New.

PLANERS & SHAPERS
52"x36"x40' Cincinnati Planer.
36"x36"x16' Ohio Planer.
28" Smith & Mills Shaper.
16" Gould & Eberhardt Shaper.
12" New Haven Vertical Slotter. Late.
6" Pratt & Whitney Vertical Shaper.

PRESSES
100 Ton Hannefin Hydraulic. 1942.
50 Ton Dennison. Late.
45 Ton Reliance. 1942.
No. 8-6 Zeh & Hannemann. 1942.
No. 1 Ross O.B.I. Late.
No. 18 Bliss O.B.I. Late.

SAWS
10"x24" Peerless Vertical. 1942.
14"x20" Racine "Shear Cut". 1942.
13"x13" Peerless Universal. 1943.
11"x11" Peerless "Hydra Cut". 1945.
No. 5 Wells Band. Late.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSES

HIGH QUALITY NEW, USED AND REBUILT MACHINE TOOLS

Indianapolis
MACHINERY & SUPPLY CO., INC.
1961 South Meridian Street, Indianapolis 6, Indiana
Telephone: GArfield 4421

EXPORT OFFICE:
44 Whitehall Street, New York City

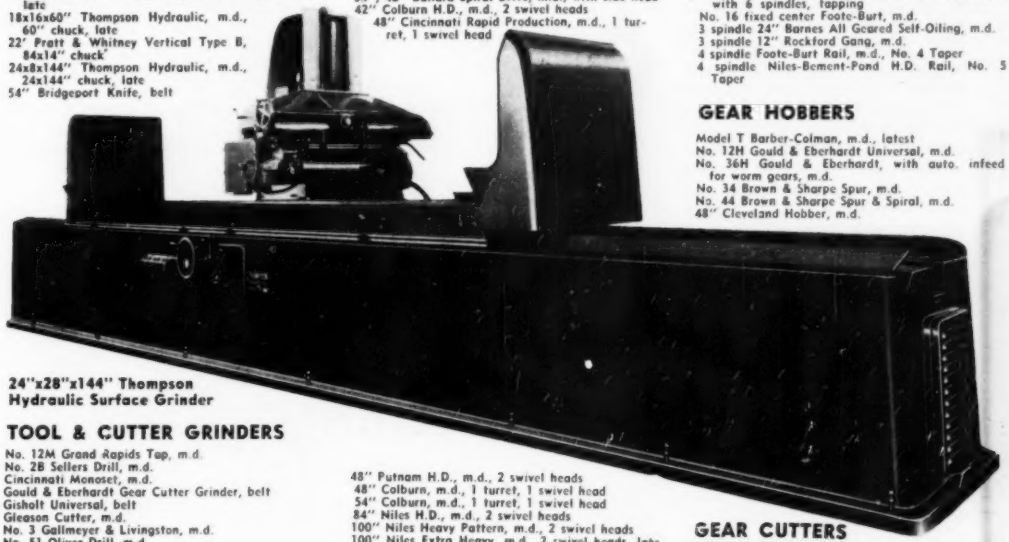
MEXICAN OFFICE AND WAREHOUSE:
Hidalgo Oriente 2-535-B, Mexico, D. F.

THE SIGN OF QUALITY
THE MARK OF DEPENDABILITY

EASTERN REBUILT MACHINE TOOLS

SURFACE GRINDERS

No. 3 Abrasive, m.d. in base
No. 11 Blanchard, m.d., 16" chuck, late
No. 16-26" Blanchard, m.d.
No. 22-12" Heald Rotary, m.d.
No. 25A-16" Heald Rotary, m.d., late
No. 25A-24" Heald Rotary, m.d., late
No. 33 Abrasive Vertical, m.d., 18x6" chuck
No. 260-16" Heald Rotary, belt
14" Pratt & Whitney Vertical, m.d., 12x36" table
10x12x60" Norton Hydraulic, m.d., 60x10" chuck, late
18x16x60" Thompson Hydraulic, m.d., 60" chuck, late
22' Pratt & Whitney Vertical Type B, 84x14" chuck
24x8x144" Thompson Hydraulic, m.d., 24x144" chuck, late
54" Bridgeport Knife, belt



24"x28"x144" Thompson Hydraulic Surface Grinder

TOOL & CUTTER GRINDERS

No. 12M Grand Rapids Tap, m.d.
No. 2B Sellers Drill, m.d.
Cincinnati Monoset, m.d.
Gould & Eberhardt Gear Cutter Grinder, belt
Gisholt Universal, belt
Gleason Cutter, m.d.
No. 3 Gallmeyer & Livingston, m.d.
No. 51 Oliver Drill, m.d.
No. 4T Sellers Tool, m.d.
Sterling Tool 3 motor drive
Gleason Cutter, belt

THREAD GRINDERS

No. 33 Excello Precision, m.d., late
No. 39A Excello Internal, m.d., late

DISC GRINDERS

No. 4 Gardner, m.d., 2-16" discs
No. 20 Gardner Disc Grinder & Roll Sander, m.d.
7½ H.P. Standard Elec. Tool Co. D.C. Disc, 18" discs, new
7½ H.P. United States Disc, 18" discs, new

AUTOMATICS

No. 5D2-12" Potter & Johnston, m.d., latest
No. 5D2-15" Potter & Johnston, m.d., latest
No. 6A, 6C Potter & Johnston, m.d.
14" Fay, Flanders Type, m.d.
4 spindle ⅞" Model R-4 Acme-Gridley, m.d.
4 spindle ⅞" Cleveland Model M, m.d.
4 spindle 1¼" Conomatic, m.d., 1942 machine
8 spindle 1⅝" Conomatic, m.d., 1942 machine
4 spindle 2¼" Cleveland Model K, m.d.
2¼" Gridley Single Spindle, m.d.
2½" Cleveland Model A, m.d.
4¼", 4½", 5½", 6", 7¾" Cleveland Model A, m.d.
20x25" Jones & Lamson, m.d., 1942 machine

HORIZONTAL BORING MILLS

No. 25T Giddings & Lewis, 2½" bar, m.d., 1942 machine
Morris Mor-Speed Drilling & Tapping, m.d.
No. 31 Lucas, m.d., 3" bar
No. 33 Lucas, m.d., 4½" bar
No. 45 Giddings & Lewis, m.d., 5" bar
2½" Cleveland, m.d.
No. 0 Giddings & Lewis, m.d., 3⅛" bar
4" Detrick & Harvey Floor Type, m.d.
4" bar Landis Floor Type, m.d.
5½" bar Niles-Bement-Pond, m.d.
10" bar Sellers Floor Type, m.d.
No. 43 Lucas, m.d., 4½" bar

VERTICAL BORING MILLS

24", 36", 42" Bullard New Era, m.d., with side head
36" Bullard Spiral Drive, m.d., side head, taper, thread chasing attachment, 1940 machine
36", 42" Bullard Spiral Drive, m.d., with side head
42" Colburn H.D., m.d., 2 swivel heads
48" Cincinnati Rapid Production, m.d., 1 turret, 1 swivel head
48" Putnam H.D., m.d., 2 swivel heads
48" Colburn, m.d., 1 turret, 1 swivel head
54" Colburn, m.d., 1 turret, 1 swivel head
84" Niles H.D., m.d., 2 swivel heads
100" Niles Heavy Pattern, m.d., 2 swivel heads
100" Niles Extra Heavy, m.d., 2 swivel heads, late type
120" Niles Heavy Pattern, m.d., 2 swivel heads

BROACHING MACHINES

No. 4 Oil Gear Type XA, 64" stroke, m.d.
No. 75 H.P. LaPointe Hydraulic, m.d., 150" stroke, 37½ tons cap.
No. 4 LaPointe of Hudson, m.d.
Cincinnati Mill Broach, m.d., 10" spindle, new

BALL BEARING DRILLS

No. ½, 1, 2 Avey, m.d.
No. 1B Edlund, m.d., new
No. 5M-16" Fosdick, m.d.
2 spindle No. 3 Avey, m.d., p.f.
2 spindle 21" Canedy-Otto, m.d., No. 4 Taper
3 Spindle No. ½ Avey Heavy, m.d., latest
4 spindle No. 2 Avey, m.d.
6 spindle No. 2B Edlund, m.d.
6 spindle Henry & Wright Class B, m.d.
6 spindle Leland & Gifford, direct m.d., on each spindle

HORIZONTAL DRILLS

No. ½Bx50" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, latest
No. ½Bx30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. ½Bx50" Pratt & Whitney 2 spindle Deep Hole Drill, m.d., latest
No. 1Bx50" Pratt & Whitney as above
No. 1½x105" Pratt & Whitney as above
No. 1 Pratt & Whitney, older type
No. 1½ Pratt & Whitney, older type
No. 1½Bx105" Pratt & Whitney 2 spindle Hydraulic Gun Barrel Rifling Machine, 105" capacity, latest type
Pratt & Whitney Rifling Machine, belt, older type
5 spindle Detroit Semi-Automatic Hor. Drill, belt
No. 6 Barnes Twin Spindle Hydraulic Honing Machine, m.d., 1943 machine
2 spindle No. 410 W. F. & John Barnes Deep Hole Drill, m.d., latest

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head, equipped with 15 spindles No. 2
No. 3 Baush, m.d., drilled for 34 spindles, equipped with 12, No. 2
P7 Baush Hydraulic, 20x30" head, bored for 22 spindles, equipped with 12
D13H Natco, 18x12" head, bored for 24, equipped with 6 spindles, tapping
No. 16 fixed center Foote-Burt, m.d.
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 12" Rockford Gang, m.d.
4 spindle Foote-Burt Rail, m.d., No. 4 Taper
4 spindle Niles-Bement-Pond H.D. Rail, No. 5 Taper

GEAR HOBBERS

Model T Barber-Colman, m.d., latest
No. 12H Gould & Eberhardt Universal, m.d.
No. 36H Gould & Eberhardt, with auto. infeed for worm gears, m.d.
No. 34 Brown & Sharpe Spur, m.d.
No. 44 Brown & Sharpe Spur & Spiral, m.d.
48" Cleveland Hobber, m.d.

GEAR CUTTERS

No. 3-26" Brown & Sharpe, m.d.
No. 4-48" Brown & Sharpe, m.d.
3" Gleason Straight Bevel, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.
8" Gleason Mfg. Type Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
National Broach & Machine Red Ring Gear Speeder, m.d., 10" size
Cross Gear Tooth Rounder, m.d., 9" cap.
Gleason Gear Tester, m.d.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d., Filmatic Spindle, 1942 to 1945 machines (3)
No. 2 Cincinnati, m.d., older type spindle (12)
Cincinnati Valve Seat Grinder, cap. ⅜" valve stems, m.d.

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 18" spindle
No. 55 Heald, m.d., 24" spindle
No. 73 Heald Airplane Cylinder, m.d., brand new

UNIVERSAL CYLINDRICAL GRINDERS

12x24" Cincinnati Self-Contained, m.d., Filmatic Spindle
No. 2-12x30" Brown & Sharpe, belt
12x30" Landis Hydraulic, m.d., latest
12x36" Cincinnati Self-Contained, m.d.
12x36" Cincinnati, belt
12x48" Cincinnati Hydraulic, model ER, m.d., latest
12x48" Norton, m.d., 1942 machine
16x48" Cincinnati, belt
18x48" Cincinnati Hydraulic, m.d., latest

We carry an average stock of 2,000 machines in our 11 acre plant at Cincinnati. Let us quote on your requirements.

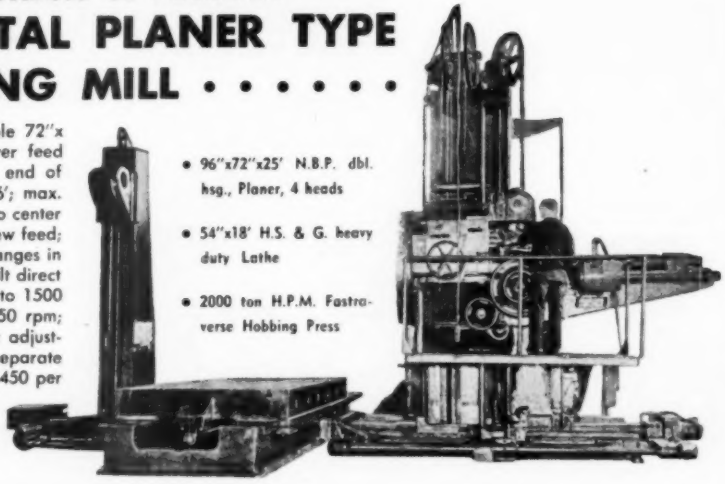
THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241 — CABLE ADDRESS EMCO

EMERMAN offers from STOCK

7" DETRICK & HARVEY

HORIZONTAL PLANER TYPE BORING MILL . . . . . .

● Working surface of table 72"x 144"; Travel of table power feed 10'2"; max. distance from end of spindle to outer support 16'; max. distance from top of table to center of spindle 8'2"; Bar has screw feed; has 4 mechanical speed changes in gearbox and 35 HP, 220 volt direct variable speed motor, 500 to 1500 rpm; spindle speed 1 to 450 rpm; outer support has 5' power adjustment on outer way with separate motor; feed range .010 to .450 per rev of spindle; with power feed in all directions to table and head on upright.



- 96"x72"x25' N.B.P. dbl. hsg., Planer, 4 heads
- 54"x18' H.S. & G. heavy duty Lathe
- 2000 ton H.P.M. Fastraverse Hobbing Press

EMERMAN MACHINERY CORP.

875 W. 120TH STREET — CHICAGO 43, ILLINOIS

ADVERTISED PRICES ON PRACTICALLY NEW MACHINES

(1) THOMAS #7 HEAVY DUTY POWER SQUARING SHEAR, 8'x5/16" CAPACITY. Purchased new in 1946. Actual use six months. PRICE $4,850.00

(1) STAMCO PRESS BRAKE, 120"x12" GAGE, Toggle Arm Type, Excellent Condition. PRICE $3,500.00

(2) #2G BROWN & SHARPE AUTOMATIC SCREW MACHINES, with 1½" High Speed Spindle, Excellent Condition. PRICE ..... $4,000.00 ea.

(1) 50 TON LAKE ERIE HORIZONTAL HYDRAULIC PRESS, Type C Frame, Excellent Condition. PRICE $1,000.00

(1) 200 TON HYDRAULIC STRAIGHTENING PRESS, Mfg. by Hydraulic Press Mfg. Co., Length of Bed 240", Width 24", Clearance Between Rods 30", Excellent Condition. PRICE $4,500.00

(1) #3 BARBER-COLMAN HOB GRINDER, Excellent Condition. PRICE $1,300.00

GEMCO 20" SHAPER, WITH 12" VISE, MOTOR DRIVEN, SERIAL #5649, MFG. IN 1946. PRICE $3,250.00

DEFIANCE #3A HORIZONTAL TABLE TYPE BORING MILL, 3½" Bar, Serial #867-35. With Turchan Follower. Excellent Condition. PRICE $9,000.00

(1) VINCO INVOLUTE GEAR CHECKER, Complete with all equipment, and involute master. Excellent Condition. PRICE $1,450.00

(2) PRATT & WHITNEY 9" GEAR GRINDERS. Excellent Condition. PRICE ..... $1,000.00 ea.

(2) DETROIT GEAR GRINDERS, Model GG-19. Excellent Condition. PRICE ..... $1,150.00 ea.

(1) ILLINOIS GEAR CHECKER, MODEL #337, Diameter 12", 42" Between Centers. PRICE $1,250.00

(6) CLEVELAND RIGIDTURNERS, MODEL NO. 616, Excellent Condition. PRICE $2,000.00 ea.

(1) #75-A HEALD INTERNAL GRINDER, Serial #22065. PRICE $2,250.00

(2) #74 HEALD INTERNAL GRINDERS, Serial Nos. 24002 and 24003. PRICE ..... $2,250.00 ea.

(2) TURCHAN FOLLOWERS FOR BULLARD BORING MILLS. PRICE ..... $1,000.00 ea.

(1) TURCHAN FOLLOWER FOR MONARCH ENGINE LATHE. PRICE $1,000.00

(1) #4 GISHOLT RAM TYPE TURRET LATHE, With Bar Feed, Chuck and some tooling. PRICE $3,250.00

LODGE & SHIPLEY DUOMATIC, MODEL #3A, Serial No. 36402, Practically New. PRICE $4,250.00

MONA MEMBER

WINSTON MACHINERY COMPANY, Inc.

517-23 SOUTH DELAWARE STREET, INDIANAPOLIS 4, IND.

NEW—SURPLUS

HIGH SPEED DRILLS

TAPER OR STRAIGHT SHANK

½"	$1.41 ea.	49/64"	$3.09 ea.
33/64"	1.55 ea.	25/32"	3.09 ea.
17/32"	1.55 ea.	51/64"	3.45 ea.
35/64"	1.79 ea.	13/16"	3.45 ea.
9/16"	1.79 ea.	53/64"	3.64 ea.
37/64"	1.90 ea.	27/32"	3.64 ea.
19/32"	1.90 ea.	55/64"	3.83 ea.
39/64"	2.02 ea.	7/8"	3.83 ea.
5/8"	2.02 ea.	57/64"	4.02 ea.
41/64"	2.26 ea.	29/32"	4.02 ea.
21/32"	2.26 ea.	59/64"	4.21 ea.
43/64"	2.50 ea.	15/16"	4.21 ea.
11/16"	2.50 ea.	61/64"	4.59 ea.
45/64"	2.74 ea.	31/32"	4.59 ea.
23/32"	2.74 ea.	63/64"	4.87 ea.
47/64"	2.97 ea.	1"	4.87 ea.
¾"	2.97 ea.		

12 or more drills — 10% discount

VICTOR MACHINERY EXCHANGE, INC.

251 Centre St., New York 13, N. Y.
CAnal 6-5575

Model 1-S Gisholt Balancing Machine, 1948
No. 9A Marvel Hack Saw, M.D.
Nos. 3U & 3L Gorton Engravers.
No. 0G B & S High Speed Automatics.

D. E. DONY MACHINERY CO.
47 Laureltop Road, Rochester 9, N. Y.

MILLERS FOR SALE

BRIGGS Type 2A 18" feed Hyd. Latest
BROWN & SHARPE #13 Plain Auto. Motor Drive
CINCINNATI #3, #4 Plain rect. overarm MD
INGERSOLL 30x24x12" Planer Type MD
KEARNEY & TRECKER #4 Heavy Timken MD
SUNDSTRAND Model 2A Duplex Timken Latest
VAN NORMAN #2 Duplex Universal MD

HARRISON MACHINERY EXCHANGE, INC.
South 4th St., Harrison, N. J.
Tel.: HUMBOLDT 2-5750, 2-5775

LATEST TYPE NEARLY NEW MACHINES

AUTOMATIC SCREW MACHINES

BILLINGS & SPENCER #B2 DI-matic Cut Off
BROWN & SHARPE #4, 5" capacity, Latest Type
BROWN & SHARPE #2G High Speed, Latest Type
CONOMATIC 2⅝", 6 spindle, Latest Type
GOSS & DeLEEUW 8" Automatic Chucker, 5 spindles
NATIONAL ACME 9/16, 5 spindle, Model D, M.D.

BORING MILLS—Horizontal

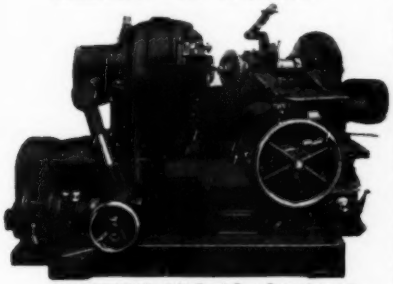
CINCINNATI-GILBERT 3½" Bar, Floor Type, Latest
DETRICK & HARVEY 4" bar, Floor Type
GIDDINGS & LEWIS #25, 2½" Bar, M.D.
HEALD 48A, 49 Single End Bore-Matics, Latest
LANDIS #35, 3½" Bar, Floor Type, M.D.
LUCAS #41, 3" Bar, Table Type, Latest Type
NILES BEMENT POND 5", 6", bar, floor type, M.D.
NILES BEMENT POND 8" floor type, M.D.
UNIVERSAL 5" bar, table type, high speed, latest

BORING MILLS—Vertical

BETTS 120" 2 swivel heads, AC, M.D.
BULLARD 61 Maxi-Mill, 2 heads, Motor Drive
BULLARD 16" 6 spindle, 8 spindle, Mult-au-matic, Type D Single Indexing, Latest Type
BULLARD 36" Vertical Turret "Spiral Drive" Latest
BULLARD 36" Vert. turret side head, New Era, M.D.
COLBURN 72" AC, M.D., 2 swivel heads, PBT
KING 62" 2 swivel heads, PBT, M.D.
NILES 38-44 Vert. Turret Side Head, PBT, M.D.
NILES 100" 2 Swivel Heads, PBT, M.D.

BROACHES

AMERICAN V-2, 6 ton Vertical, hydraulic, latest
CINCINNATI 1-30 Duplex Vert. Hyd., Latest
CINCINNATI 3-30 Duplex Vert. Hyd., Latest



GLEASON 12" Straight Bevel Gear Generator, max. cone distance 8½"; max. DP 3; latest type

DRILLS—Radial

AMERICAN 4' arm 11" col. "Hole Wizard", latest
AMERICAN 4' arm 12" col. triple purpose, M.D.
AMERICAN 5' arm 13" col. triple geared, M.D.
CIN. BICKFORD 6' arm 15" col. Plain or Univ., M.D.
DRESES 4' arm 12" col., Plain, Motor drive
DRESES 5' arm 15" col. Univ., motor drive
FOSDICK 5' arm 14" col., Plain, motor drive
NILES 6' arm 15" col., Univ., motor drive
WESTERN 6' arm 20" col., Plain, latest type

GEAR CUTTING EQUIPMENT

BARBER COLMAN #12 Hobber; motor drive
BARBER COLMAN Type S Hobber, Latest Type
FELLOWS Model Z Gear Shaper, High Speed, Latest
FELLOWS 6-1, 7A, 72, 75, 77, 61A High Speed Gear Shapers, latest type
FELLOWS Type 6Z2 Gear Shaper, High Speed, Latest
FELLOWS #13 LS Lapping, Latest Type
GLEASON 7", 12" Straight Bevel Generator, latest
GOULD & EBERHARDT 12H, 12HS Hobber, Latest
GOULD & EBERHARDT 23SH Hobber, M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2 Universal, Latest
BROWN & SHARPE #5 Plain, 3rd, Latest Type
BROWN & SHARPE #20, 10x18 plain, latest type
CINCINNATI 6x18 plain Model EA, hyd., latest
CINCINNATI 16"x36", Plain, "Filmatic" Latest
LANDIS 4"x12", 4"x18" Type H, Plain, Hyd., Latest
LANDIS 6x18 Type C, Plain, hydraulic, latest
NORTON 6"x18", Type C, Plain, Hyd., Latest
NORTON 10x72 centers Plain Type C Mech., Latest
NORTON 14x36" centers Plain Type C Hyd., Latest

GRINDERS—Misc.

BRYANT #5, #16-16, #16-CP-16, #24, Internal Hydraulic, Latest Type
CINCINNATI #3 Centerless, Motor Drive
CINCINNATI #2 Centerless, "Pilmatic", Latest
CINCINNATI Centerless Lapper, Model ED, Latest
CINCINNATI "Monoset" Tool & Cutter, Latest
COVEL #22 Universal Tool & Cutter, Latest type
COVEL #91A Univ. Cutter and Tool, Latest
EXCELLO #46C Carbide, Latest
FITCHBURG 14"x25" Spline, Hydraulic, Latest
GLEASON #12 Tool Sharpener, Latest Type
HEALD 50, 70 Internal Motor Drive
HEALD 75A, 72A3, 72A5, 74, 70A Internal, Latest
HEALD #72A3, 72A5 Internal "Gagematic", Latest
JONES & LAMSON 6x15, 8x18, Auto. Thread, Latest
LANDIS 5" Oscillating, External, M.D.
PRATT & WHITNEY Contour, Latest
THOMPSON 6"x18" Auto., Round Broach, M.D.

GRINDERS—Surface

BLANCHARD #11—16 chuck, Latest Type
BLANCHARD #16—24" chuck, Motor Drive
DO-ALL Model G-7, 9"x20", Hyd., Latest Type
GALLMEYER & LIVINGSTON #25, 8"x24", Latest
HEALD #22, 12" chuck, Rotary, latest type
HEALD 25A, 16" or 30" Chuck, Rotary, Hyd., Latest
NORTON 6"x18"—Hyd.—Latest Type
THOMPSON 12x12x24 Type B Hyd., Latest
THOMPSON 12x12x40 Type B Hyd., Latest

LATHES—Engine and Mfg.

AMERICAN 36"x360" centers, 2 carriages, M.D.
BRIDGEFORD 36"x24' centers, 2 carriages, M.D.
JONES & LAMSON "FAY" 36"x25" Automatic, Latest
LEHMAN 16x30 hydrarrol, Timken, latest type
LODGE & SHIPLEY 18"x22" centers, M.D.
LOSWING 4x80, 4x84, 8x90, 8x108, 5x34" centers, latest
MONARCH 22x456" centers, Model CM, 3 car, Timken Latest Type
MONARCH 12x54" centers Timken, Latest Type
MONARCH 10x20" centers, Model EE Timken, Latest
MONARCH 12x30" centers, Timken, Latest Type
MONARCH 24"x54" centers, geared, Motor Drive
NILES 42"x60", double head, M.D.
NILES 90x110 centers Standard Driving Wheel, M.D.
NILES 48x87" centers, Boring and Turning, M.D.
NILES 72"x62" centers, Boring and Turning, M.D.
NILES 30x50' Boring, Timken, Latest Type
PRATT & WHITNEY 16x30" centers, Timken, Latest
PRATT & WHITNEY 10x20" centers, Bench, Latest
PRATT & WHITNEY 16"x60" centers, geared, M.D.
PUTNAM 42"x25' centers, geared, Motor Drive
REED PRENTICE 16x24" centers, geared head, M.D.
REED PRENTICE 16x48" centers, Geared Head, M.D.
SCHUMACHER & BOYE 24"x158" centers, geared, M.D.
SPRINGFIELD 16"x30" centers, Timken, Latest Type
SPRINGFIELD 16x43" centers Geared Head, M.D.
WARD HAGGAS & SMITH 18x36"x16' bed, Gap

LATHES—Turret

BARDONS & OLIVER #5, #7 Timken, latest
CINCINNATI ACME No. 1, Latest Type
FOSTER 4FU, Fastermatic, Timken, Latest
GISHOLT #3, 4, Univ., Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest Type
JONES & LAMSON #3, #5, Univ., Latest
MOREY No. 2G, No. 3, No. 4 Timken, latest
POTTER & JOHNSON 5D, 5D2E, Timken, Latest
WARNER & SWASEY 2A, Univ., Bar & Chuck, with or without "PRE-SELECTOR", Latest
WARNER & SWASEY #5, Univ., Timken Bearing
WARNER & SWASEY #1A, Univ., Latest Type

MILLING MACHINES—Mfg.

CINCINNATI 24" Duplex, Timken, Motor Drive
HALL Style D, Planetary, Latest Type
INGERSOLL 42x38x12' Planer type, Adjustable rail, 4 heads, AC, M.D.
INGERSOLL 32x30x12' Planer Type Slab, AC, M.D.
INGERSOLL 32x24x16' Planer Type 2 heads, AC, M.D.
SUNDSTRAND Model 3A, Duplex, Timken, Latest Type
TAYLOR & FENN M-80 Duplex, Spline, Latest Type

MILLING MACHINES—Plain

BRIGGS Type A Hyd., 12" and 18" feed, Latest Type
BROWN & SHARPE #12, 24" feed, Timken, Latest
BROWN & SHARPE 3B, Timken, Latest
BROWN & SHARPE No. 2 Light Type, Timken, Latest
CINCINNATI #4 Timken Bearing, M.D.
CINCINNATI #3, 4, 5, Motor Drive
CINCINNATI 4-36 Hydromatic, latest type
CINCINNATI 0-8 Auto. rise and fall, Timken, Latest
KEARNEY & TRECKER #3, 4 heavy, Timken, latest
KEARNEY & TRECKER 121S simplex, latest
KEMPSMITH #4 Maxi-Mill, Timken, latest

MILLING MACHINES—Vertical

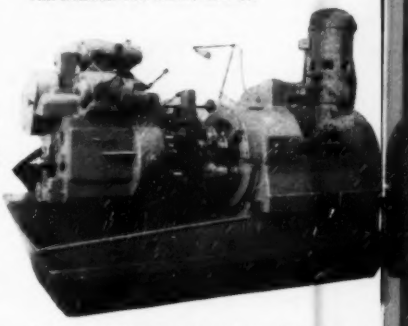
CINCINNATI 0-8 Timken Bearing, Latest Type
CINCINNATI #2, 3, 4, Dial Type, Timken, latest type
GORTON #3 Super Speed, Latest Type
KEARNEY & TRECKER #3H, Timken, Latest
REED PRENTICE 3VG with or without Hydraulic Duplicator, Timken Bearing, latest type

MILLING MACHINES—Thread

HANSON & WHITNEY 4"x9" centers, Latest Type
LEES BRADNER 12x24, Model HT, Latest Type
PRATT & WHITNEY 6x60" Type C, Latest Type
MOREY 12x30, 12x60, Latest Type

MILLING MACHINES—Universal

AMES 2½"x19" Table, Latest Type
BROWN & SHARPE #4A; Motor Drive
CINCINNATI No. 3, dial type, High Speed, Latest
CINCINNATI #3 Dial Type, med. speed; latest
HARDINGE Model UM, Timken, Latest
KEARNEY & TRECKER #2 Heavy, Timken, M.D.
KEMPSMITH #4 Maxi-miller, Timken, Latest
VAN NORMAN #12 Timken, Latest Type
VAN NORMAN #3, Duplex, M.D.
VAN NORMAN #36, Timken, latest type



GOSS & DeLEEUW 8" Automatic Chucking Machine, work rotating spindles, 5 spindles, power operated chucks, latest type.

PLANERS

DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
GRAY 36x36x8', 2 heads, maximum duty, DC, M.D.
NILES BEMENT POND 48x48x16', 3 heads, AC, M.D.
NILES 54x54x18' 4 Heads, Box Table, DC, M.D.
SELLERS 30' Plate Edge, Motor Drive
WOODWARD & POWELL 54x54x20', 4 hds., DC, M.D.

PRESSES

BIRDSBORO 225 ton, vert. hyd., Latest Type
CHAMBERSBURG 50 ton vert. hydro-pneumatic
CLEARING Type DS 1125-32 dbl., action 125 ton, Latest Type
CLEARING Type H-50-36-35 ton Vert. Hyd., Latest
FERRACUTE #DG-55, 75 ton drawing, Latest Type
HPM 37-ton Vertical Hydraulic, Latest
NILES 600 Ton Horiz. Wheel Press, M.D.

MISCELLANEOUS

AJAX 1½", 3½", Bolt Heading, Upsetting and Forging
BARNES #172, 306H, 307 Vertical Hone, Latest Type
CAMPBELL #101 Abrasive Saw, Latest Type
CLEVELAND 12"x16" Cutter Reliever, Motor Drive
GROB #08-20 Band Saw & Filer, Latest
MICHIGAN #1708A Cutter Reliever, Latest Type
PELLOW #2 Nut Slotter, Latest Type
PRATT & WHITNEY "Keller" Type G, Type BL2416—Latest Type
PRATT & WHITNEY ½Bx30, ½Bx50 2 spindle Deep Hole Drill, Latest
PRATT & WHITNEY ½Bx50 2 spindle Rifler, Latest
QUICKWORK ⅝", 1" Capacity Rotary Shear, M.D.

Most Built After 1941

Available for Prompt Shipment

(Partial List) Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured

MOREY MACHINERY CO., INC.
406 BROOME ST., NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-5360
CABLE ADDRESS: WOODWORK, N. Y.

Make BOTWINIK NEW HAVEN Your Machinery Headquarters

Modern Machine Tools Immense Stock..... Ready to Ship

DRILLS

Baush M.D. Multi 12 Spd. #3 M.T.
Avey & Allen 3, 4, 5, & 6 Spindles
Fox M.D. Type 138C Multi Spdl. Late
Cincinnati-Bickford 3', 4', 5' & 6' Radials
Niles-Bement & Pond 6' Radial
Barnes No. 2—4 Spd. M.D. Hydram Late

GRINDERS

Norton 6"x10"x36" Surface
Norton 15"x17"x72" Surface
B. & S. Nos. 1, 2, 3, 4 Universal
Bryant Nos. 3B, 6 & 12 Internal
Cincinnati No. 2 & No. 3 Centerless
Cincinnati No. 3 Centerless Lapper
Blanchard No. 16—26" & 16A
Blanchard No. 16—30 Vert. Late
Heald No. 22—12", 16" Rotary Surface
Abrasive Nos. 33, 3 & 34 Surface
Heald Nos. 70A & 72A Internal
P. & W. 14" Vert. B. B., M.D.
Norton Type "C" 6"x18" M.D. Hyd. Cyl
Norton 10"x24" M.D. Plain Cyl.
Landis "H" 4"x18" Plain Late

LATHES

Johnson 36"x36' B.G.L.C.G. Engine
Monarch 12"x30" CK (swings 18")
Hendey Plain 12", 14", 16", 18" Yoke Head
Hendey 12"x5' Y. H. Fact. M.D.
Hendey 24"x8' M.D. Q.C.G. Eng.
Hendey 12"x5' M.D. Geared Head
Amer. 18"x12' B.G. M.D. Engine
American 30"x16' G.H. M.D. Q.C.G. Eng.

MILLERS

K & T 2H D.O. M.D. Pl. Late
K & T 2H Vert. M.D. Sliding Hd. Late
Pratt & Whitney Keller Type BL-2416
Semi-Auto. Duplicator
K. & T. No. 2HL, No. 4H Plain
Milw. No. 3B Univ. D.O.
Cin. Nos. 2 & 3 Vert.
Van Norman No. 3SP Plain
Van Norman Nos. 0, 10 & 11 Duplex
P. & W. 8", 10" & 12" Auto.
P. & W. 6"x80" M.D. Thread
P. & W. 6"x14" Int. Thread
Cinn. No. 3 M.D. Plain
Potter & Johnston 2M Horiz. Auto
Gorton No. 9J Vert. Late
B. & S. No. 21 Plain Auto.
Kempsmith No. 2G Plain Late
Kempsmith No. 4, Plain Max. Late

SHAPERS

Cincinnati 24" M.D. Crank Late
Hendey 32" M.D. Crank Late
Gould & Eberhardt 24" Crank
Gould & Eberhardt 16" M.D. Crank

PRESSES

Verson 500 Ton S.S. 8" St. M.D.
Niagara #612-C, Double Crank Double B.G. M.D.
Bliss No. 5½-42 M.D. S.S. double crank
Bliss No. 304 M.D. S.S. Single Crank
Bliss No. 703 M.D. Flat Edge Trimming
Bliss No. 21 O.B.I. Power

SCREW MACHINES

B. & S. Nos. 00, 0, 2 Automatic
B. & S. Nos. 1 & 2 Hand
Gridley ⅞", 1¼", 1¾" & 2⅝" Model G
Cone 1¼", 3¼", 3½" & 4¾"—4 Spindle
Simmons No. 2 Micro-Speed
Foster No. 7 & 7B
W. & S. Nos. 1, 2, 2A, 3A Univ.

BROACHES

3 ton American vertical
No. 1 Foote Burt duplex surface
9 ton American horiz. surface
Twin 10 Oilgear duplex
No. 3XA Oilgear
30 ton No. V48 American vertical
No. 3 Lapointe screw type

RADIAL DRILLS

3' Morris
4' Hammond elbow arm
4' Cint. Bickford universal
4' American triple purpose
6' Dreses
6' Cincinnati Bickford
7' American triple purpose

GEAR CUTTERS

Nos. 3, 12 & Type T Barber Colman
Nos. 8H, 12H & 16 HS Gould & Eberhardt
No. 130 Cleveland Rigidhobber
Nos. 1, 5A & 5AC Lees Bradner
No. 5M Adams Mfg. hobber
12" Reed Ring gear shaver

GRINDERS

Model HRS Barber Colman hob & cutter
Nos. 1 & 2 Brown & Sharpe universal
6"x18", No. 10 B. & S. Elec. hydraulic
10"x18" & 14"x36" Landis hydraulic
10"x36" & 23"x36" Norton hydraulic
Nos. 10 & 16 Blanchard rotary surface
12" & 16" No. 22 Heald rotary surface
18" & 24" No. 25A Heald rotary surface
10x24 Norton hydraulic surface
12"x48" Thompson hydr. surface
14"x60" Mattison hydr. surface
53", No. 372 Gardner horiz. disc
No. 115 Gardner opposed disc
30", No. 230 Hanchett opposed disc
Nos. 72A3 & 72A5 Heald internal
No. 18A16 & 24-36 Bryant internal
10" Pratt & Whitney gear grinder
No. 2 Cincinnati centerless
Nos. 33 & 35 Excello thread
No. 2 Norton tool & cutter

LATHES, TURRET

No. 2 FU Foster Fastermatic
24" & 42" Bullard vertical
Nos. 2, 3, 4, 1A & 3A Warner Swasey
Nos. 4 & 3AL Gisholt
Nos. 6, 2 Denver universal
Nos. 2G & 3 Morey
No. 601 DD Oster
Nos. 5 & 7 Bardons & Oliver

MILLERS, MFG.

24" & 48" Cincinnati duplex
No. 3—36 Cincinnati Hydromatic duplex
No. 18-36 Kearney & Trecker duplex
Nos. 1-12, 1-18, 2-18 & 2-24 Cincinnati automatic
Nos. 3-24, 4-36, 4-48, 5-60, 56-72 & 56-90 Cincinnati Hydromatic
Nos. M18, M24 & 12-24 Kearney & Trecker
Nos. 1, 1M & 3 Kent Owens
30", 42" & 84" Ingersoll Rotary
No. 08 Cincinnati, horiz. vertical or rise & fall
Nos. 4, 40 & CT36 Lees Bradner thread
Types C & D Hall Planetary

PRESSES

No. 2½ Toledo OBI
No. 6 Consolidated OBI
No. 23 Bliss OBI
Nos. PA4 & CA4 Ferracute horning
Nos. 1½ & 1½C Bliss cam drawing
42", No. 90E Toledo double crank
Nos. 304 & 75½ Bliss straight side
No. 56 Toledo straight side
350 ton Clearing No. F1350-42
600 ton Hamilton No. 2316½
700 ton No. 7C Ajax forging
75 ton Southwark hydraulic
300 ton French Oil hydraulic
500 ton Clearing hydraulic

373 WELTON ST., NEW HAVEN 9, CONN.
EXPORT DEP'T: 44 G WHITEHALL ST., NEW YORK

Botwinik Brothers
INCORPORATED

1-12 spindle Kingsbury Type Auto-Drill built by Moline Tool Works
Roller Type Scalping Machine 22" Slab Capacity
#1A W&S Turret Lathes Bar Feeds
Libby 26" Turret Lathe, 4½" Hollow Spindle
#33 ExCello Ext. Thread Grinders
Lees Bradner CT 36" Thread Millers
W.S. Bowling Contour Roll Grinder
Farnham Forming Roll 12'
Onsrud Router Model A-4-RR 84"
Moline 3 sp—Model 7D—Cylinder Borer
6 sp. Baird Chucker 15 HP AC Motor Drive
Air Compressors 50 H. P. I. R.

CONTINENTAL SALVAGE & MACHINERY CORPORATION
1836 EUCLID AVENUE, CLEVELAND 15, OHIO
MAIN 4602

National Bent Shank Nut Tappers Battery of ⅝" to 1" Machines.
Waterbury-Farrel Fdry. ⅝" and 1" D.S. S.D. Cold Headers, also Thread Rollers.
Fisher 5" Bar, Floor Type Boring Mill. New in 1942.
Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.
Bliss Presses in all sizes up to 1,000 ton capacity.
Wire Working Machinery.

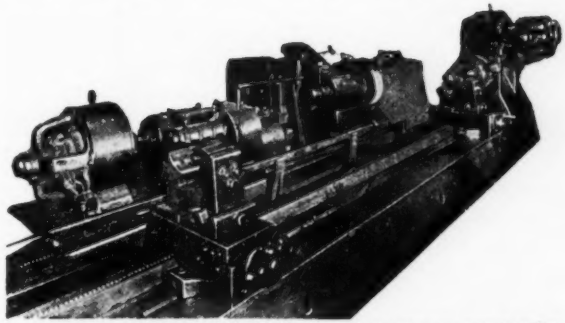
National Machinery Exchange
128-138 Mott St., New York 13, N.Y.

MILES MACHINERY CO.
SAGINAW, MICH.

SCARCE LATE MODELS

Consomatic 1¾" 8 spindle
TANNEWITZ, DO ALL ML BAND SAW #36M
3" UNIVERSAL HORIZONTAL BORING MILL
CHICAGO (D&K) #335 PRESS BRAKE, WITH DIES
Cin. Bick. 21" Super Service
DELTA SINGLE & MULTIPLE DRILL
Walker Turner Bench Drills ½"
Excelsior 21", Buffalo 18" Drills
GORTON DUPLICATORS 9J
GORTON ENGRAVERS 3U, 3L, 3Z.
ME. CUTTER GRINDERS
BROWN & SHARPE #2B SURFACE GRINDER
Norton, Thompson 6"x18" Surf. Grind., Hydraulic Feed
G&L #18, 25, 35 Hyd. Surface
Abrasive #11½, 3B, 34 Surface
Heald #23A Rotary Surface Grinder
Gorton Cutter Grinders
Atlantic 6"x18 Surface Grinder
CINCINATI 12x36" UNIV. GRINDER, HYDRAULIC, FILMATIC
#2 CINN. CENTERLESS, FILMATIC
Covel #91A Tool & Cutter Grinder
P&W Radius Grinders 12"x36" Surface
Hammond & Excello Carbide Grinders
Gardner #226 Disc Grinder
Black Diamond Drill Grinder
Oliver 510, Sellers 4G Drill Grinders
LANDIS #6 THREAD GRINDER
Sail & Jewel Plastic Grinders
NILES CEMENT POND 2500 lb. Steam Hammer
Davis #4 Keyseater, #2 Baker
Hi Speed Hammers all sizes
BOYE & EMMES 20"x30' G.H. LATHE
Monarch 10x20" Lathe Model EE
Handey 12x30" G.H. Lathes
Lodge & Shipley 16"x78", 12 speed
S. Bend 9x3½", 10x48"
Sebastian 12"x4' G.H. Lathe
LeBlond Regal 15" x 30, 18" x 3½', 21"x60", 16"x30" Hd.
Sheldon TRB-56" Lathe
Hardinge, Rivett Precision Lathe
Cinn. & Sebaunr Speed Lathes
WARNER & SWASEY #3, 4 PRE-SELECTOR TURRET LATHES
Gisholt #4, 5 Univ. Turrets, Tooling
Morey #3 Turret Lathe
Acme #6W M.D. Foster 3B
Oster 601 Rapiduction Turret
Hardinge ESM 2nd operation
Brown & Sharpe #1, 2F Hand Screw
GORTON VERTICAL MILL RD, 9J, POWER FEED & PLAIN,
Cinn. #2 Pl. Hi Speed Drill
Morey 12M Profiler 2 Sp.
Nichols Hand Mill Vert. Head
Van Norman Prod. Mill, Sunstrand
Burke #4 Mills Pl. & Univ.
Cinn. I-12, 2-18 Prod. Mills
Brown & Sharpe #12 Electric, #000 Production Millers
Van Norman #12, 26, 36 Duplex Head
Cinn. #3 Plain, #4 Vert. Dial Type
Kent Owens IV Prod. Mills, U.S. Mills
Reed Prentice #10D6 60Z. INJ. MOULDER
MARVEL AUTO. HACKSAW #6A
BLISS PRESS #58 OB Gap. 62, 62A, 162
Stokes Tablet Presses
V&O #102 Reducing Presses
Toledo 400 Ton Knuckle Joint Press
Diamond #31, 30 ton OBI Press
Bliss #4, 5½, Styles Presses
Federal #5 OBI Press, Bliss 21
V&O. Z&H, OBI 25, 35 ton, 25B
Ferracute 1/DG 36 105 ton Double action cam press
CANEDY OTTO 3'x9" COL. RADIAL
Oliver Heavy Die Filer, Fellows 725 Gear Shaper
Onsrud Router #W240
Micromatic Hydrohoner H-1
Waterbury Farrel #30 Thread Roller & Dies 1943
Porter Cable GB Belt Sander
Bakewell #1, Ultromat Tappers
Hasking 3C Tapper
Taylor Winfield 50 KVA Spot Welders
Thompson & Belsky Seam & Spot Welders
Rafter Mod. 26 Tube Roller
Oliver 20" Woodworking Planer
Peerless #226, Eyeletting Mach.
Clark Hardness Tester
Gen. Flexible Elec. Screw Press
P & W Electrolimit Gage
Lenox ⅝" Throatless shear

AARON VALUES IN MODERN TOOLS



NORTON ROLL GRINDER 50"x28' Centers. Motor Driven, actual swing 54". Bed divisible into two sections. *IMMEDIATE DELIVERY.*

NEW IN STOCK

Power, Foot & Gap Shears—30" to 96"
8' 10 Ga., 6' 10 Ga., 6' 14 Ga.
Spot & Arc Welders, 6x6" Racine Hacksaw
4, 5, 7, 10, 12, 18, & 30 ton OBI Power Presses
Ammco 7", Shaps Rite 8", Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses, Air Hydraulics
Kalamazoo Metal Band Saws
No. 1½ Abrasive Wet Surface Grinder
20 ton Northern Hydraulic Presses
10Z & 20Z Injection Moulders
Famco 6C Arbor Presses—½ Price—Presses
Sheldon 12" B.G. Shaper

AUTOMATICS

Cone 4 spindle, Gridley
Brown & Sharps #4, 6 Auts., #2 Hand Screw

BORING MILLS

#0 Giddings & Lewis srv. M.D. 3"
2½" Cleveland srv. M.D., 2½", 4" Binsse
Niles-Bement-Pond 4- duplex, 60" Niles
Bullard New Era 24", 42", King 42"

GRINDERS

Surface Grinders, 6x18, 8x24, Abrasive, G. & L.
P. & W. 14", B.B., Vert. Surface 19"x49"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", MD. Cyl.
Heald No. 72A3 Gagematic
Norton 56"x28' M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D. Cyl.
No. 55, 60, 65 Heald Int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 16, 11, Cyl.: 1, 3 Univ.

LATHES

14"x8' Headey Taper, Collets 10"x8'
9" LeBlond, P&W 1"x10" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D., American 20"x10' GH, TA
Wade, Hjorth, Hardinge, P & W Precision Bench

MILLING MACHINES

3B K. & T. Dbl. Overarm
Cleveland Vert. No. 1 M.D.; #1 Univ.
#2B K. & T. Univ.; No. 2, 2A B & S Univ.
No. 3B Cincinnati, S.P.D. rapid trav.
Nos. 1½, 2, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller, Hansen Whitney
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 2, 3, 4 Cincinnati Vert., S.P.D.

HYDRAULIC EQUIPMENT

500 TON LAKE ERIE PRESS
Platen 35"x36", 36" stroke, 08" opening, 150 H.P., 220-440 V. Motor.
600 Ton Baldwin South. Platens 70"x58, Stroke 22", Opening 36"
500 Ton H.P.M. Double Action with 100 ton cushion. Platen 36"x36", Stroke 24", Opening 36".
1000 Ton French-Oil Bed 53x42", stroke 20" daylight 56".
Brand New 300 ton Watson-Stillman Hobbing Press & Pump.
375 Ton ELMES Double Action, with 60 ton cushion. Platen 84"x44", 12" Stroke, 42" Opening.

350 TON VERSON PRESS
40x48 Platen, 36" stroke, 72" opening, 100 H.P. 3 phase—60 cycle 440 volt.

400 & 500 TON SHAFT STRAIGHTENERS, Self Contained

All Hydraulic equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your hydraulic problems.

P. & W. No. 12, 1 & 2 spind. Profiler
B & S. No. 1, 3 Vert., Kempsmith No. 1, 2
Taylor-Fenn Spline Miller

RADIALS

Carlton 8' Arm 10" col. M.D., 3½' Mueller
4', 5', 6' American Triple Purpose
Walker-Turner ½" cap., Cinn. Bick. 6'

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B, M.D. Univ.
J. & L. 2"x24", 3"x36", W & S #4, 2A

MISCELLANEOUS

Buffalo 25UD Comb. Punch-Shear
Pexto 3' to 8' Shears & Brakes
Gorton 1A; 375-2 Tool & Cutter Grinders
Wiedman Turret Punch—Type R4P
8" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72, 725 Fellows Gear Shapers
Deckel G1, G2, G1F Engraving machine
Leland-Gifford 1, 2 & 4 spindles, Model MS
Geo Ohl 8' 16 Gage M.D. Shear, 12' 10 Ga. Brake
Otter No. 31SB 6" Pipe Threader, M.D.
Bliss 36" Gang Slitter, 15, 20, 21 OBI Presses
Double End Buffers, 1HP, 5HP
K R W., Lemco Hydr. Arbor Presses
McCabe Pneumatic Flanger

WRITE FOR OUR FREE ILLUSTRATED CATALOG

AARON MACHINERY CO., Inc.

45 Crosby Street
WOrth 4-8233

New York 12, N. Y.
Cable: AARMACH, N. Y.

MONA

HEADLINERS

NEW IN 1943-1944

16"x54" ctrs AMERICAN "Pacemaker" Lathe, taper, collets, chucks
#1-18 CINCINNATI Plain Miller, backlash eliminator
#24-H GOULD & EBERHARDT Gear Hobber
10"x24" LANDIS Type C Univ. Grinder
24" CINCINNATI-BICKFORD Drill Press

LATHES

14"x6' MONARCH Model C Tool Room
14"x6' AMERICAN 12-speed Grd Hd, AC MIB, taper
20"x8' LODGE & SHIPLEY Selve Grd Hd, AC MIB, taper
22"x10' ROCKFORD 3 SCD DBG bowl hd
24"x12' BOYE & EMMES, AC Turner Uni-Drive
24"x14' LODGE & SHIPLEY, Turner Drive, Taper
30"x16' LODGE & SHIPLEY, Lima Drive, taper

MILLERS

#1M CINCINNATI Rect. O/A Pl., AC MIB
#2 CINCINNATI H.P. Rect. O/A Plain, AC MIB, PRT, Timken
#2B MILWAUKEE Plain, AC MD, DOA
#2M CINCINNATI Plain, AC MIB, Timken, #50 spindle
#4 CINCINNATI H.P. Univ., Lima Drive, div hd, vert hd, slot attach
#4B BROWN & SHARPE Plain, AC MIB, DOA, #50 spindle
6"x84" PRATT & WHITNEY Thread

SHAPERS & PLANERS

14", 24", 28", 32" GOULD & EBERHARDT High Duty
28" AMERICAN H.D., AC MD
30"x30"x8' CINCINNATI, AC MD
36"x36"x16' GRAY, AC MD, 4 hds

DRILLS

#2 COLBURN Mfg.
#3 AVEY, AC MD, 12" OH
21" & 24" CINCINNATI-BICKFORD sltd hd

RADIAL DRILLS

4' MORRIS, MD
6' CINCINNATI-BICKFORD mtr on arm
7' DRESES, 12" col., AC MD thru gearbox

GRINDERS

#2 BROWN & SHARPE Univ., factory AC MD
#3 ABRASIVE Surface, AC MD

BORING MILLS

#3A UNIVERSAL Horz. 3" bar, SPD
#43 LUCAS Horiz., AC MD, 4½" bar, 20' betw faceplate & outer support
38" KING Vert. Boring Mill, AC MD
42" BULLARD "New Era" Vert. Turret Lathe

GEAR MACHINERY

#1 ADAMS Hobber, AC MD
#18H GOULD & EBERHARDT Hobber, AC MD
#34 BROWN & SHARPE Hobber, AC MD
#61 FELLOWS Shapers

TURRET LATHES

#2B FOSTER Univ. Grd Hd, SPD
#4-W CINCINNATI ACME Univ., AC MD, thread chasing
#4 GISHOLT Univ., AC MIB, "Preselector", new 1942

MISCELLANEOUS

#4 WATERBURY-FARRELL Thread Roller, AC MD
2½" LANDIS Double Head Bolt Threader, AC MD
10" PRATT & WHITNEY Vert. Shaper
10'x16 ga. CHICAGO Steel Leaf Brake, AC MD
INGERSOLL-RAND XB2 Air Compressor, 888 cu. ft., AC MD

YOUR INQUIRIES SOLICITED

COX MACHINERY CO.,
P. O. Box 1953 CINCINNATI 1, OHIO
OFFICE AND WAREHOUSE: 311-313 Bakewell St. Covington, Kentucky
Three minutes from the Cincinnati hotel district

GET LONGER LIFE AND GREATER EFFICIENCY WITH BOTWINIK
NEW • USED • REBUILT MACHINE TOOLS

LATHES

Niles Bement Pond 48"x24' G.H. Eng. Lathe; dist btwn cents. 13'; motzd carriage.
Bridgeford 36"x58', 15 speed G.H. Eng. Lathe; MD, AC elec. equip., power rapid trav. to carr; compound rest; 2 steady rests; gw. 38" over bed, 20" over carr; dist. btwn ctrs 48'; motorized apron and taper atchmts.
Hendey 24"x18' Yoke Head Eng. Lathe; dist btwn cents 12'; taper atchmt, M.D.
American 30"x24' Medium Pattern 12 speed, G.H. Eng. Lathe; dist. btwn cents 18'; swings 34"; 2 carriages.

MILLERS

Cin. #3S Rect Overarm Univ. Milling Machine; motor in base; late type; tble wk. surf. 55½"x12"; feed long. 34", cross 12", vert 20"; spdle speeds 16, range 18-500 RPM.
Kempsmith 2G Univ. Miller (late type 1943); motor in base; tble wk. surf. 45"x10"; range long. 28", cross 10", vert. 19"; spdle speeds 18, range 18-575 RPM; #50 taper; Univ. dividing hds; vise, arbor, etc.
B. & S. No. 3A Univ. Miller; motor in base; tble overall 57½"x13¼"; feeds long. 34", cross 12", vert. 19".
Van Norman No. 2SU Univ. Miller (very latest type); tbl. wk. surf. 50"x12"; feeds long. 24½"; cross 10", vert. 17"; 18 spdle spds, 25 to 1250 RPM.

BORING MILLS

Univ. No. 44 Tri Way Hor. Boring Machine; 4½" bar; Morse #6 taper; max. dist. face plate to outer support 108"; power vert feed to hd 50"; max. dist tble to cent of spdle 52½"; size of tble 46"x75" motor driven.
Yoder 3A Hor. Bor. Mill; dia. of bar 3"; Morse taper #5; dist. to outer support 72"; bar trav. 24"; latest type, M.D.

RADIAL DRILLS

Cin. Bickford, Super Service 6', 19" col. Radial Drill, 1942 machine.
American 4' 13" col. Hole Wizard Rad. Drill, 32 speeds; 1946 machine.

NEW RAFTER SHEAR—2 Sizes
¼" x 10'—mild Steel
⅛" x 10'—Stainless Steel
3/16" x 12'—mild Steel
3/32" x 12'—Stainless Steel
Immediate delivery from stock

Write, Wire or Phone for latest listings of our huge stock.

Botwinik Brothers of Mass. Inc.
3 SHERMAN ST. WORCESTER 1, MASS

BENNETT SPECIALS

36" Bullard Mill, Spiral Dr., 4 Jaw
4" bar Universal Table Type Mill, 60" spin. to table, 96" spin. to outer support, '42.
3½" & 4" Landis Floor Type Mills
3" bar Yoder, Table Type Hor. Mill, 30" spin. to tble., 72" spin. to outer support
48"x20' centers N.B.P. Lathe, Grd. Hd.
36"x32" bed Niles Lathe, 2 carr., T.A.
7' Carlton 17" col. Radial, 1943
Nos. 5, 4, 3 & 2 W. & S. Turrets, Late
No. 4 Gisholt Univ. Turret Lathe, 1942
2⅝" Acme Gridley RB8, Automatic, 8 spin.
1⅝" Conomatic, 8 spin. (4)
#4H—12" Libby Slid. Bed Gap (5)
36"x36"x12' Cinci, Hypro Planer, 4 hds., Var. Voltage, 1943
24"x24"x16' Ingersoll Planer Type Miller, 4 hds., 20 H.P. AC, M.D.
16"/18½"x54" cc Springfield T.A. '44
#9 DT Potter Johnson Automatics (2)
48" N.B.P. Slotter, Grd., Late
15'x¼" Wickes Rolls, M.D.
42" & 36" King, Side Hd., (2) '43
2½" bar #25T G & L Table, '43
18"/20½"x54" cc LeBlond, 1943
16"/18½"x54" cc Reed Pr., 1942
3' Fosdick 11" col., late, 1943
#65 New Britain Gridley, 6 spin., '43
#36 Van Norman Miller, 1944
Index Miller, Univ., late
1⅝" New Britain Gridley, 6 spin., late (2)
24"x24"x66" Rockford Planer-Shaper
42"x42"x10' Cleveland Open Planer
ML16 Duall Saw, late

BENNETT MACHINERY CO.
30 Church St., New York 7, N. Y.

PRESSES

No. 8 Bliss Triple Crank Press, 255 ton, Bed 42" FB x 108" RL Friction Clutch, Double BG, Twin Drive, M.D.

No. 8 Bliss Double Crank Press, 255 ton, Bed 42" FB x 52" RL, Friction Clutch, Double BG, 26" Shutheight, 12" Stroke, Twin Drive

No. 6 Bliss Double Crank Press, 125 ton, Bed 34" FB x 66" RL, Friction Clutch, Double BG, 26" Shutheight, 12" Stroke, Twin Drive

No. 3 Bliss Double Crank Press, 35 ton, Bed 26" FB x 36" RL, M.D.

No. 1-B Super Speed High Speed Press, 10 ton, Double Roll Feed, 1000 SPM, Motor drive with Reeves Unit

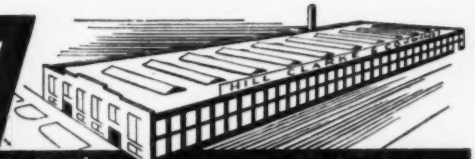
HOWARTH MACHINERY CO.
505 E. 9 Mile Road, Detroit 20, Mich.
Phone JOrdan 4-6490

LATHES FOR SALE

BRIDGEFORD 30x24' centers Motor Drive
JONES & LAMSON "Fay" 20x25" Auto. Latest
LODGE & SHIPLEY 18x22" centers MD
LODGE & SHIPLEY #5 Duomatic Latest
LOSWING 8x60" centers Latest Type
NILES 30x50' boring "Timesaver" Timken Latest
NILES 20x48" and 72" centers MD
NILES 30x100" centers Motor Drive
NILES 42x30' centers Motor Drive
NILES 48x87" centers boring and turning MD
NILES 72x359' centers boring and turning MD
PUTNAM 42x25' centers geared MD
SCHUMACHER & BOYE 24x158" centers geared Motor Drive

HARRISON MACHINERY EXCHANGE, INC.
South 4th St. Harrison, N. J.
10 minutes from New York City—5 minutes from Newark, N. J.
Tel.: HUMBOLDT 2-5750, 2-5775

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

FOR YOUR PROTECTION ONLY HILL-CLARKE OFFERS YOU THIS 5 WAY GUARANTEE

1. A responsible organization—over 80 years experience.
2. Modern machines—no worn out equipment.
3. Every machine remanufactured or carefully inspected by experienced craftsmen.
4. You can see your machine tested under power.
5. Hill-Clarke's unconditional money-back guarantee.

STEWART WARNER CORP'S GEO. L. MEYER, JR., V. P. Stewart Die Casting Division tells Hill-Clarke's President H. W. Mons, right, "The used machines we have purchased during the past 30 years from Hill-Clarke have always given us excellent performance."

AUTOMATICS

No. 2 Brown and Sharpe
1⅝" Greenlee, 7 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1⅝" (1942)
No. 6 Brown & Sharpes

DRILLS

No. D8 Colburn No. 6 Morse Taper
No. 2LMS—26"—1 Spdl. Leland-Gifford
No. 2LMS—14"—3 Spdl. Leland-Gifford
No. 2LMS—28"—4 Spdl. Leland-Gifford
No. 2LMS—28"—6 Spdl. Leland-Gifford
No. 3B—24"—6 Spdl. Edlund (1942)
No. 4BL Natco 36 Spdls.
7'-15" Col. American Full Universal
6'-17" Col. Fosdick Radial

GEAR MACHINES

No. 61A Fellows
No. 7125 Fellows (1943)
No. 712 Fellows Auto Indexing (1943)
No. 72 Fellows Gear Shaper
No. 18H Gould & Eberhardt
12" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter

HORIZONTAL BORING MILLS

No. 31 Lucas, 3" bar
No. 46-B Heald Bore-Matic

GRINDERS

4"x12" Landis, Model H (1942)
4"x18" Landis Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x48" Norton Type C Plain (1943)
Norton Motorized Grinders
6"x18" —— to —— 24"x240"
12"x36" Landis Type LCH Universal (1945)

No. 5—8"x24" Covel Hydr. Surf. (1941)
No. 25A—24" Heald Rotary Surface (1943)
No. 36-A Hanchett Rotary Surface

72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)
No. 5 Bryant Internal Grinder (1942)
No. 16-16 Bryant Internal Gdr. (1942)
No. 16-36 Bryant Internal Grinder (1942)
No. 24—26 Bryant Internal Grinder (1941)

LATHES

14"x6' Hendey Yoke Head
15"x5' Sebastian, Grd. Head
16"x60" centers Pratt & Whitney, Model B
16"x54" centers LeBlond (1941)
18"x6' American, Grd. Head
19"-38" gap x 10' LeBlond
36"x30' Lodge & Shipley
36"—48"x16' Lehman Hydratrol (1945)
48"x20' centers Simmons (1942)
50"x17' centers LeBlond (1942)

LATHES (Production)

8"x15" Sundstrand, Model D (1943)
10"x22" Sundstrand, Model AA (1943)
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)

MILLING MACHINES

No. 4 Cincinnati Plain (1943)
No. 08 Cincinnati Vert. (1942)
No. 2 H Milwaukee Vertical
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 1-18 Cinn. Mfg. (1940)
No. 2—18" Sundstrand-Electromil (1942)
No. M-24 Milwaukee Simplex (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 34-38 Cinn. Hyd. Duplex
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x80" Pratt & Whitney Thread
6"x132" Pratt & Whitney Thread Miller
6"x168" Pratt & Whitney Thread
10"x48" Hanson-Whitney Thread
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
No. 10 Ingersoll 72"x8' Traveling Col. Face Millers (1942)

MISCELLANEOUS

18" Dill Slotter
Model H-7 Micromatic Hydro Honer
Model H-2 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
8-M Wells Band Saw
No. 20 Bliss O.B.I. Press
No. 2 V & O open back press
Baush Radial Tapper (1942)

PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

TURRET LATHES

No. 3 Jones & Lamson Bar Feed
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Midland, Bar Feed
No. 2-A Warner & Swasey
No. 1-H Libby, 61/4 Hole in Spindle (1937)
No. 1-H Libby, Extras Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

VERTICAL BORING MILLS

36" Rogers, side hd. (1942)
42" Bullard New Era
60" Colburn
72" Niles Extra Heavy
84" Betts

FEATURE OF THE MONTH

No. 5 Warner & Swasey Universal Turret Lathes with Surface Speed Preselectors. Furnished with or without Automatic Chuck & Bar Feed. See under power at plant now.

ASK FOR OUR COMPLETE LIST

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500

FOR SALE LIKE NEW

CINCINNATI INTERNAL & EXTERNAL HYDRAULIC UNIVERSAL GRINDER 12" x 36" WITH FILMATIC BEARINGS and PRATT & WHITNEY JIG BORER #2 ROWBOTTOM CAM MILLER.

CAPITOL MACHINERY CORP.
253 Centre St., New York 13, N. Y.

PRACTICALLY NEW
2—FEDERAL SEAM WELDERS

200 KVA—60 CYCLE—440 PRIMARY VOLTAGE

(1) Straight in feed, 45"x3.5" Throat
(1) Cross through feed, 45"x3.5" Throat Depth

AIR OPERATED PRESSURE TO ROLLS

Complete with GE Thyratron Seam Welding Controls. Price.....$1,500.00 ea.

WINSTON MACHINERY CO., INC.
517 South Delaware Street
INDIANAPOLIS 4, INDIANA

Landis Type D Plain Grinder 20x48", late model.
#2 Cincinnati Centerless Grinder, old.
Kearney-Trecker 2-spindle milling machine, old.
Fay Automatic Lathe 27" centers, old.
Natco horiz. dbl end drill, machine, late model.
Crown tumbl. barrel, maple wood lined 36x65", new.
Groh saw Model 08-20 late model.
#6 Bliss punch press 125 ton cap., late model
Lindberg electric furnace 1250°, new.
Demco tapper, 3 spindle, late model.

The Perfection Steel Body Co., Galion, Ohio

STOCK TOOLS — Prompt Shipment

BORING MILL, Hor. #0 G & L, 3" bar.
BORING MILL, Vert. 14" Niles 2 Hds., M.D.
BORING MILL, 42" King, 2 Hds., M.D.
BORING MILL, 72" N-B-P, 2 hds., M.D.
BRAKE, Press, 36"x½", M.D.
BROACH, XA Oilgear, Hor., 60" Str.
DRILL, Radial 3' & 5' Cincinnati-Bickford.
DRILL, Radial 6' American, Mtr. on Arm.
GEAR HOBBERS, 12-H Gould & Eberhardt.
GRINDER, Broach, "E" Thompson, 6x48" Hyd.
GRINDER, Int., No. 72-A-5 Heald, Hydraulic.
GRINDERS, Surf. Nos. 3 & 5 Abrasives.
GRINDER, Surf. Rotary No. 25 Heald.
HAMMER, Pneumatic, Nos. 4-B & 6-B Nazel.
HAMMER, St. Forging, 6000# Chambersburg.
LATHE, 14"x6' Hendey, Tie-Bar, T.A., M.D.
LATHE, 14"x6' L & S, 12-Speed Grd. Hd.
LATHE, 22"x16' L & S, Q.C.G., T.A.
LATHE, 42"x8' c.c. L & S, q.c.g.
LATHE, Turret, No. 3-A W & S, 4½" h.s.
MILLERS, Pl. No. 4, & 5 Cincinnati.
MILLER, Plain No. 4B K & T, Vert. Att.
MILLER, Thread, No. 46 Lees-Bradner.
MILLER, Duplex, 24" Cincinnati.
MILLER, No. 2—24 Cincinnati, Rise & Fall
MILLER, Univ., No. 4 Cincinnati
PRESS, No. 59½, Toledo, 1200 Ton, 14" Stroke
PRESS, S.S., 250 Ton Chambersburg, Hyd.
SHAPERS, 24" and 32", M.D.
SHAPER PLANERS, Openside, 26" Farquhar.
SHEARS, 12" x 18 ga., 11'x1½".
UPSETTER, 4" National, M.D.

LANG MACHINERY COMPANY
28th St. & A.V.R.R. Pittsburgh, Pa.

MACHINE TOOLS

42"x42"x12' Cincinnati Planer, 3 Heads, MD
#3B Foster Universal Turret Lathe, 5" hole in spindle
17" LeBlond Heavy Duty Production Lathe, Geared Head 58" centers, MD
1-M Cincinnati Milling Machine
24" Cincinnati Automatic Duplex Mill
16"x6' Lodge and Shipley Geared Head Lathe
16"x5' Reed Prentiss Engine Lathe, G.H. M.D.
#3HD High Speed Riveting Machine, M.D.

CARLSON MACHINERY COMPANY
2316 Westbrook Drive, Toledo, Ohio

FOR SALE

1 Model 48-A Heald bore-matic. Slide-Ways in bed and on table never used. Machine has been used on a light milling operation cross-wise of table. This hydraulic milling attachment plus two slightly used redhead boring heads, and one new boring head, are included with the machine. Price $2300.00.

1 Lempco Du-All combination lathe and grinder, Model H. This machine will swing 52" diameter work when grinding or turning surfaces. Price $550.00.

1 LeBlond #1 cutter grinder. Price $235.00.

1 Model #204 Matthews general purpose marking machine. This is a new machine which has never been used and is complete with pneumatic attachment for work table and roller die holder to hold mortised roller dies. Machine new cost $620.00. Price $300.00.

FULLER MANUFACTURING & SUPPLY COMPANY
712-716 Central Ave., Cincinnati 2, Ohio

10"x72" NORTON Type C Plain Grinder, 1942
12"x16"x60" THOMPSON Type C Surface Grinder, 1941
50"x17' cc LeBLOND "Big Swing" Lathe, 1942
Nos. 3, 4, & 5 W&S Ram Type Universal Turret Lathes

WIGGLESWORTH MACHINERY CO.
199 Bent St. Cambridge, Mass.

FOR SALE

1—250 Kling Rotary Shear, arranged for and including a three (3) horse power — 220 volt — three phase — 60 cycle—1800 RPM motor and controls, together with Kling Flanging Attachment and Strip Shearing or Squaring Gauge.

IMMEDIATE DELIVERY

Dakota Steel Products Co.
East 15th St., at 8th Ave. So.
Sioux Falls South Dakota

200 hp ELECTRIC MOTOR—Westinghouse 440/220 v, 227 amp, CCL Induction Constant Speed, 1150 rpm full load, 3 phase 60 cycle. With starter box, good condition. $2000.

WOOLDRIDGE CO.
Box 54, Phone 2-2283, Jeffersonville, Ind.

CRANES—FOR SALE—BARGAINS!

MILWAUKEE 5 ton; 25' span; 230 volts DC
MILWAUKEE 5 ton; 37'2" span; 230 volts DC
MILWAUKEE 10-ton; 38' span; 230 volts DC
MILWAUKEE 25-ton; 84'4" span; 230 volts DC

HARRISON MACHINERY EXCHANGE INC.
SOUTH 4th ST., HARRISON, N. J.
TEL.: HUMBOLDT 2-5750, 2-5775

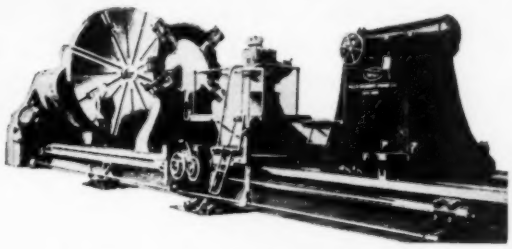
FOR EVERY
BUSINESS WANT
"Think Searchlight *First"*

don't miss the annual catalog of used and surplus new machine tools in the searchlight section of* AMERICAN MACHINIST *january 27

ENGINEERED REBUILT MACHINE TOOLS

BUILT MACHINE TOOLS ENGINEERED REBUILT

14' x 50' (34' centers) NILES LATHE



14' x 50' (34' centers) NILES SCREW CUTTING ENGINE LATHE, Power rapid traverse to carriage, compound rest. Arranged for motor drive.

SPECIFICATIONS:

Max. swing over ways	174"
Swing over carriage, gap piece out	153"
Swing over carriage, gap piece in	138"
Takes between centers, max.	408"
Steel spindle bearings, front	22"
Steel spindle bearings, rear	14"
Diameter of face plate	144"
Face of steel internal driven gear	8"
Carriage bearing on ways	88"
Feeds 27; range per RPM .010 to .400	
Threading range .100 to 4"	
Steady rest range, dia.	28" to 50"
Tailstock bearing on bed	87" x 72"
Tailstock spindle 12"; adjustment	24"
Speed range, RPM	.233 to 23
Lead screw diameter	3⅞"

EQUIPMENT:

Main drive motor, power rapid traverse motor and motor for moving tailstock. Compound rest, four face plate chuck jaws, steady rest.
Net weight, appx. (lbs.) 190,000
'Boxed wgt., appx. (lbs.) 210,000

FOR IMMEDIATE SHIPMENT!

- 5" Niles Horizontal Boring, Milling, and Threading Machine, Late Type
- 36" x 24' Niles "Timesaver," Geared Head Engine Lathe.
- 36-44" Niles Vertical Turret Lathe with side head
- 24" Bullard "NEW ERA" Spiral Drive Vertical Turret Lathe
- 26" Libby Turret Lathe, 7½" Hole, Thread Cutting
- 2½" Spl. Cleveland Horizontal Boring, Table 20" x 42"
- 32" Cincinnati Shaper
- 18" and 24" NEW Simmons Shaper
- No. 2 and 3 Brown-Sharpe Universal Millers
- No. 1 NEW Simmons Plain Miller
- 6" Pratt-Whitney Vertical Shaper
- #70 Heald Internal Grinder, 3-Motors
- No. 2 NEW 1¼" Simmons B.G. Turret Lathes
- #36-H Gould & Eberhardt Gear Hobber
- 12' Pneumatic Flanging Clamp

SIMMONS MACHINE TOOL CORPORATION

MAIN OFFICE AND PLANT 1719 N. BROADWAY, ALBANY 1, N. Y. NEW YORK OFFICE 50 EAST 42ND STREET

ENGINEERED Machine Tool REBUILDING

McDONALD
USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive No. 34 M.D. Vert. Surf Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp, Speeds Model "M"
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. No. 3-A
L & S 18x12' & 20'x10', 20'x8' Grd. Hd., M.D.
& 28"x12' Lathes Monarch Model "C"
American 24x12 grd. hd. lathe, m.d. q.c.g.
American 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck
Cincinnati No. 2 Centerless Grinder
Colburn 60" & 72" Vert. Boring Mills
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd, S.P.D. Pl, Miller.
W. & S. No. 2A grd. hd, Univ. Turret Lathe, S.P.D.
Foster No. 2F Ostermatic grd. hd. Turret Lathe, M.D.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

HEAVY EQUIPMENT FOR SALE

AJAX 1½", 3½" Upsetter and Forging MD
BIRDSBORO 325 Ton Vertical Press Hydraulic New 1942
BULLARD 16 6-spindle Multaumatic New 1943
CLEARING 50 Ton Hyd. Press New 1940
CRANES from 5 to 30 ton cap. 230 volts DC
DILL 20-24" Vertical Slotter MD
LAKE ERIE 500 Ton Vertical Press Hyd. New 1944
NILES 600 Ton Horiz. wheel press MD
NILES 100" Vertical Boring Mill 2 swivel heads, MD
NIAGARA 1000, 1200 KVA Transformers
QUICKWORK ¾", 1" cap. rotary shear MD
UNITED ENG. 2,000-ton Hyd. Steam

HARRISON MACHINERY EXCHANGE, INC.
South 4th St. Harrison, N. J.
Tel.: HUMBOLDT 2-5750, 2-5775

AUTOMATICS

#0G B & S, late type
1½" & 1⅝" 8 Spdl. Cone, late
9/16", 1", 1¼", 1⅝", 2", 2¼", 2⅝" Acme Gridleys, late
2½ & 2⅝" Cone 6 Spdl., late
12" and 16" 8 Spdl. Bullard Multaumatics, late

PRESSES

2800 ton Bliss Hydr., 3 cal. type, 12" str., 50½" sht. ht., dia. bed 115"
60 ton Dbl. Crank, 5" stroke, 48x24 bed, late model Waterbury Farrel
90 ton Dbl. Crank, 8" stroke, 48x18 bed, late model Bliss
35 ton 4, 5, 6" stroke, latest type, w/all accessories, Bliss $850.00 ea.
70-85 ton 4" stroke 21 x 27 bed, 110 strokes per min., Bliss, latest type
90-125 ton 4½" or 5" stroke, 60, 80, 110 (optional) strokes per min., late type
Inclinable, New, 20 to 70 ton, immediate delivery
375 ton Elmes, 12" stroke, 84x54 bed, late type
350 ton Elmes, 20" stroke, 36x45 bed, late type
250 & 750 Baldwin, 144x48 bed, 40" stroke
#305 Bliss, 12" stroke, late

TURRET LATHES

#3 & #5 Warner & Swasey, late type, lots of tooling
#4FU Fastermatic, 4" cap., late type
#3HB Libby Sliding Bed Gap, 8¼" cap., late type

PAUL'S MACHINERY COMPANY
6111 Vermont Avenue
Detroit 8, Michigan
TYLER 7-6300

MONA MEMBER

Bor. Mill, Hor. 3" G and L, MD.
Boring Mills, 24"-30"-42"-52"-72"-90"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
Lathe, Turret 3-A W and S, S.P.D.
Millers, Plain No. 3 K and T, No. 4 Cin.
Millers, Vertical No. 3 B and S and No. 4 Cin.
Shaper, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.
Squaring Shear, Niagara 11'x10 gauge

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

UNUSUAL VALUES

Milling Machines—No. 1, Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 10"x36", Surface 12"x24", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10—16"x6', 8', 10'—18"x6', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized
Large stock 12" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes—J & L 2"x24"—3"x26" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3⅛" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" Hi Duty 3" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88, Columbus 16, Ohio

THE CASE OF THE FORTUNATE FOUNDRY

Finds a 28% boost in finish grinding air scoop flaps with

METALITE* CLOTH BELTS

When this shop converted from set-up wheels to the belt backstand method, interruptions in production were cut 'way down, one METALITE Cloth Belt outlasting four set-up wheels, permitting almost constant production, with time-out for belt change only one minute. The operation was finish grinding the outside edges of air scoop flaps — magnesium castings. DURABONDED METALITE Cloth Belts, #50-X grit, 2" x 118", were used over soft contact wheels, 16" x 2" x 1¼" rough edge — belt speed, 8500 SFPM. Output jumped to 60 per hour — 28% over the set-up wheel method formerly used, finish was better and costs were cut substantially.

You may find it profitable to check these findings against your production, with a demonstration in your plant of the belt method with METALITE Cloth Belts. Write, wire or 'phone us to arrange it.

GET THE COMPLETE SERIES

Our booklet "Production Talks Backstands" gives you a whole series of similar case histories with convincing facts and figures. Write for your copy today.

BEHR-MANNING

* Reg. U. S. Pat. Off.

BEHR-MANNING · TROY, N.Y.

NORTON *abrasives*

THE BELT METHOD IS THE BETTER METHOD
. . . AND THE BETTER BELT IS METALITE

INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives 42-43, 204, 223, 252

Accessories & Attachments (Machine Tool) 206, 208, 216

Balancing Machines 14-15

Bearings 16, 30, 50, 64, 172

Bending Machines.....162

Books, Technical.....200, 214

Boring, Drilling & Milling Machines (Horizontal) ..... 2nd Cover

Broaching Machines 73, 136, 147

Centering Machines 14-15, 237

Centers.....229

Chucks 29, 167, 212, 224

Coolant Systems, Filters & Supplies....198

Cut-Off Machines: Sawing Machines.....218, 230

Die Casting Machines.....216

Dressers, Grinding Wheel.....200

Drilling Machines...14-15, 20, 32, 77, 133, 157, 173, 189, 208, 212, 217, 218, 226, 232

Duplicator Machines..... 26

Electrical Parts & Equipment...39, 67, 68, 169, 195, 209

Electroplating Equipment & Supplies..176

Engineering & Production Services.171, 176

Fasteners.....59, 190, 193, 208, 218

Forgings 126

Gages & Instruments...33, 34, 49, 60, 134, 143, 177, 180, 184, 198, 210, 232

Gear Cutting Machines....3, 6-7, 179, 203, 221, 224

Gear Testers 3

Gears, Speed Reducers, Motor Reducers 24, 66, 174, 176, 202, 220, 221

Grinders—Cutter & Tool..... 3rd Cover, 18-19, 63, 202, 218, 235

Grinding Machines—Production..5, 12-13, 33, 34, 52, 200, 202, 224, 227, 230, 234

Heads: Drilling, Grinding & Tapping..234

Heat Treating Equipment & Supplies..210, 230

Honing Machines 70, 228

Hydraulic & Pneumatic Parts & Equipment..51, 168, 181, 187, 207, 226, 233, 236

Jig Borers 185, 222

Lathes, Automatic.....3rd Cover, 14-15, 27, 38, 47

Lathes, Engine.....17, 21, 28, 153, 178, 188

Lathes, Turret.....25, 61, 65

Lubricants, Cutting Fluids, Quenching Oils, Rust Preventives...53, 82, 159, 165, 182, 191, 196, 213

Lubricating Systems & Equipment....198

Marking Machines & Tools.....206, 232

Materials, Cutting & Forming.....31, 75, 196, 236

Materials of Manufacture.....4th Cover, 48, 58, 62, 69, 138, 145, 149, 155, 163, 164, 166, 197, 225

Materials Handling Equipment.....160

Millers, Die Sinkers, Profilers.4, 8-9, 14-15, 201, 224

Planers 72

Plastic & Rubber Molding Machines... 71

Polishing & Buffing Machines.....176, 202

Power Transmission 24, 215

Presses, Forging & Forming Equipment & Supplies..46, 71, 78, 151, 162, 175, 181, 183, 192, 198, 224, 228, 230, 232

Riveting Machines.....212

Safety Equipment..... 40

Screw Machines; Chucking Machines.36-37, 50, 205, 218

Shapers, Slotters, Keyseaters...56, 84, 206, 230

Special Machine Tools.....14-15, 234

Steel Blue 206, 210

Tapping Machines.....173, 189, 218

Threading Machines....10-11, 199, 214, 232

Tooling Set-Up Equipment.....74

Tools, Cutting...22-23, 35, 41, 44, 45, 54, 57, 76, 158, 161, 170, 184, 194, 199, 206, 218, 219, 221, 222, 224, 232, 238

Tools, Hand.....39, 157, 161, 196, 202

Transportation 238

Welding & Cutting, Brazing & Soldering Equipment & Supplies.....211, 254

AIRCO ANNOUNCES

The Aircomatic Process... An entirely new idea for welding aluminum in ALL POSITIONS

Sensational in its conception, Airco's new *Aircomatic Process* introduces an entirely different aluminum fabricating technique to industry. With this process, welding of aluminum and weldable aluminum alloys ranging in thicknesses from $\frac{1}{8}$" to 2" plus, may be performed in all positions – flat, horizontal, vertical and overhead. All of the standard joint designs may be welded in these positions.

Single or multi-layer welds can be deposited using either beading or weaving techniques. Vertical welds may be made with either upward or downward travel. In short, all of the facility associated with metal arc welding of steel is made available by this process, plus the advantages of high deposition rates, far exceeding those attained by usual welding methods, which results from continuous filler metal feed and the absence of slag.

This new welding method consists of feeding a bare filler metal in wire form at speeds ranging from 100 to 300 inches per minute through a manually operated gun. The filler metal carries welding current and an arc is maintained between the end of the wire and the work. Power may be supplied from a standard d.c. welding generator. The arc is maintained within a controlled envelope of shielding gas.

THE ADVANTAGES OF THIS TOTALLY UNIQUE AIRCOMATIC WELDING PROCESS INCLUDE:

- A manual welding process with the essential features of automatic welding.
- Continuous deposition of filler metal at high rates.
- Manual manipulation of an automatic process for welding in a vertical and overhead position.
- High quality weld metal deposits.
- Minimum edge preparation owing to deep penetration.
- Ability to weld heavy sections with little or no preheat.
- No flux required; slag removal eliminated.
- Visible arc; no blind welding.

Investigate the many advantages the new Aircomatic Welding Process *offers you. For equipment, price, service or other pertinent information, call or write our nearest office.*

AIRCO **AIR REDUCTION**

Offices in Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

ADVERTISERS INDEX

	Page
Abrasive Machine Tool Co.	230
Acromark Co.	232
Air Reduction	254
Allegheny Ludlum Steel Corp.	48
Allen-Bradley Co.	67, 68
Allied Products Co.	171
Allied Research Products Inc.	182
Allis-Chalmers Manufacturing Co.	24
Almond Mfg. Co., T. B.	224
Aluminum Co. of America	69
American Broach & Machine Co.	73
American Optical Co.	40
American Screw Co.	59
American Steel Foundries, King Machine Tool Division	28
American Swiss File & Tool Co.	222
American Tool Works Co.	21
Ames Co., B. C.	180
Armco Steel Corp.	138
Armstrong-Blum Manufacturing Co.	44
Armstrong Brothers Tool Co.	74
Atlantic Gear Works	221
Barber-Colman Co.	63
Baumbach Manufacturing Co., E. A.	224
Bay State Abrasive Products Co.	204
Beatty Machine & Mfg. Co.	162
Behr-Manning Corp.	252
Bethlehem Steel Co.	31
Black & Decker Mfg. Co.	157
Black Drill Co.	208
Blanchard Machine Co.	52
Bodine Corp.	173
Boston Gear Works	174
Braun Gear Co.	220
Brown & Sharpe Mfg. Co.	41, 49
Bryant Chucking Grinder Co.	33, 34
Bryant Machinery & Engineering Co.	32
Bullard Co.	47
Butterfield Div., Union Twist Drill Co.	45
Camcar Products Co.	59
Card Manufacturing Co., S. W.	35
Carpenter Steel Co.	236
Central Screw	59
Century Electric Co.	169
Cincool Division, Cincinnati Milling Machine Co.	53
Cincinnati Bickford Tool Co.	77
Cincinnati Electrical Tool Co.	202
Cincinnati Gear Co.	220
Cincinnati Grinders Incorporated	5
Cincinnati Milling Machine Co.	4
Cincinnati Shaper Co.	84
Cities Service Oil Co.	213
Clark Trucktractor Div., Clark Equipment Co.	160
Clausing Mfg. Co.	178
Cleereman Machine Tool Co.	32
Cleveland Crane & Engrg. Co.	151
Columbus Die Tool & Machine Co.	234
Cone Automatic Machine Co.	55
Consolidated Machine Tool Corp.	17
Continental Screw Co.	59
Corbin Screw Div., American Hdwe. Corp.	59
Cosa Corporation	185
Coulter Machine Co., James	232
Cross Co.	133
Curtis Pneumatic Machinery Co.	233
Danly Machine Specialties Inc.	78
Davis & Thompson Co.	212
Davis Keyseater Co.	206
Dayton Rogers Mfg. Co.	210
Dayton Rubber Manufacturing Co.	215
Denfis Chemical Laboratories Inc.	210
Derbyshire Inc., F. W.	224
Detroit Broach Co.	147
Diecraft	206
DoAll Co.	218
Dow Chemical Co.	159
duMont Corp.	210
Du Pont de Nemours & Co., Inc., Electrochemicals Dept.	231
Dykem Co.	206
Eastern Machine Screw Corp.	224
Elco Tool & Screw Corp.	59
Elmes Engineering Works	181
Errington Mechanical Laboratory	234
Federal Machine & Welder Co.	211
Federal Press Co.	46
Fellows Gear Shaper Co.	6-7
Foote-Burt Co.	136
Fosdick Machine Tool Co.	20
Fulmer Co., C. Allen	228
Gallmeyer & Livingston Co.	200
Ganschow Gear Co.	221
Gear Grinding Machine Co.	203
Gerotor May Corporation	187
Gisholt Machine Co.	61
Gleason Works	3
Gorham Tool Co.	229
Goss & de Leeuw Machine Co.	218
Grant Gear Works	220
Grant Mfg. & Machine Co.	221
Gray Co., G. A.	72
Greenlee Bros. & Co.	205
Gulf Oil Corp.	165
Hannifin Corporation	236
Hansen Manufacturing Co.	207
Hanson Van Winkle Munning, Inc.	176
Hanson Whitney Machine Co.	199
Harper Co., H. M.	59
Hartford Special Machinery Co.	206
Hauser Machine Tool Co.	222
Heald Machine Co.	2nd Cover
Hendey Machine Co.	56
Holman Reamer Co.	206
Hones, Inc., Charles A.	230
Howell Electric Motors Co.	195
Hydraulic Press Mfg. Co.	71
Hypro Tool Co.	158
International Nickel Co., Inc.	225
J & S Tool Co.	200
Jacobs Manufacturing Co.	29
James Mfg. Co., D. O.	202
Johnson Bronze Co.	172
Johnson Manufacturing Corp.	230
Jones & Lamson Machine Co.	65
Jones & Laughlin Steel Corp.	149
Kempsmith Machine Co.	201
King Machine Tool	28
Kingsbury Machine Tool Co.	189
Knight Machinery Co., W. B.	216
Korhumel Heffron & Preiss Steel Co.	197
Kux Machine Co.	216
L. W. Chuck Co.	208
Lamson & Sessions Co.	59
Landis Machine Co.	10-11
Landis Tool Co.	12-13
Langelier Mfg. Co.	218
LeBlond Machine Tool Co., R. K.	3rd Cover
Lees Bradner Co.	214

ADVERTISERS INDEX

	Page
Leland-Gifford Co.	232
Lempco Products Inc.	198
Link Belt Co.	16
Linley Brothers Co.	212
Lodge & Shipley Co.	38
Lovejoy Tool Co., Inc.	170
Luers, J. Milton	221
Lufkin Rule Company	177
M & N Machine Tool Works	230
Macmillan Co.	214
Madison Mfg. Co.	54
Masonite Corp.	62
Mattison Machine Works	227
McGraw-Hill Book Co., Inc.	200
Mead Specialties Co.	226
Meisel Press Mfg. Co.	221
Metal Carbides Corp.	194
Milford Rivet & Machine Co.	59
Monarch Machine Tool Co.	153
Morse Twist Drill & Machine Co.	22-23
National Acme Co.	36, 37
National Broach & Machine Co.	179
National Lock Co.	59
National Lock Washer Co.	193
National Machine Tool Co.	230
National Machinery Co.	192
National Screw & Mfg. Co.	59
Newark Gear Cutting Machine Co.	221
New Britan-Gridley Machine Div., New Britain Machine Co.	140
New England Screw Co.	59
Niagara Blower Co.	168
Nicholson File Co.	161
Norton Company	18-19
Ohio Gear Co.	66
Oliver Instrument Co.	218
Ottemiller Co., Wm. H.	218
Parker-Kalon Corp.	59, 190
Parker Rust Proof Company	196
Pawtucket Screw Co.	59
Peninsular Grinding Wheel Co.	42-43
Pheoll Manufacturing Co.	59
Phillips Screw Manufacturers	59
Pittsburgh Gear Co.	221
Potter-Johnston Co., Sub. Pratt & Whitney Div. Niles-Bement-Pond Co.	27
Pratt & Whitney Div., Niles-Bement-Pond Co.	26
Production Machine Co.	202
Producto Machine Co.	175
Railway Express Agency Div. Air Exp.	238
Reading Screw Co.	59
Republic Steel Corp.	58
Revere Copper & Brass Inc.	145
Rivett Lathe & Grinder Inc.	235
Robertson Mfg. Co.	223
Rockford Screw Products Co.	59
Russell Burdsall & Ward Bolt & Nut Co.	59
Ryerson & Sons Inc., Joseph T.	166
S.K.F. Industries Inc.	64
Sales Service Machine Tool Co.	228
Scherr Co., Inc., George	184
Scovill Manufacturing Co.	59
Scully Jones & Co.	167
Seaboard Screw Corp.	59
Seneca Falls Machine Co.	237
Sentry Co.	196
Severance Tool Industries Inc.	232
Sewall Mfg. Co., E. B.	176
Shakeproof Inc.	59
Sheldon Machine Co., Inc.	188
Shore Instrument & Mfg. Co., Inc.	232
Sigourney Tool Co.	226
Skil-saw Inc.	39
Snyder Tool & Engineering Co.	217
Southington Hardware Mfg. Co.	59
Square D Co.	209
Standard Gage Co., Inc.	143
Standard Oil Co. of Calif.	191
Standard Tool Co.	219
Starrett Co., L. S.	134
Steel Company of Canada, Ltd.	59
Steelweld Machry. Div., Cleveland Crane & Engineering Co.	151
Sterling Bolt Co.	59
Stronghold Screw Products Inc.	59
Sturtevant Co., P. A.	196
Sundstrand Machine Tool Co.	14-15
Sunnen Products Co.	70
Texas Co.	82
Timken Roller Bearing Co.	50
Timken Roller Bearing Co. (Steel & Tube Div.)	4th Cover
Torrington Co.	30
Tuthill Pump Co.	198
Union Twist Drill Co.	57
V. & O. Press Co.	232
Van Keuren Co.	60
Van Norman Co.	8-9
Vascaloy-Ramet Corp.	75
Vickers Inc.	51
Victor Saw Works	184
Wales-Beech Corp.	59
Walker Co., Inc., O. S.	234
Waltham Machine Works	224
Ward Steel Co.	163
Warner & Swasey Co.	25
Weldon Tool Co.	238
Welling Inc., Charles H.	228
Westfield Metal Products Inc.	208
Wheelock Lovejoy & Co., Inc.	164
Whistler & Sons Inc., S. B.	183
Whitman & Barnes	76
Whiton Machine Co.	212
Willys-Overland Motors Inc.	186
Wilson Mechanical Instrument Co.	198
Wolverine Bolt Co.	59
Youngstown Sheet & Tube Co.	155

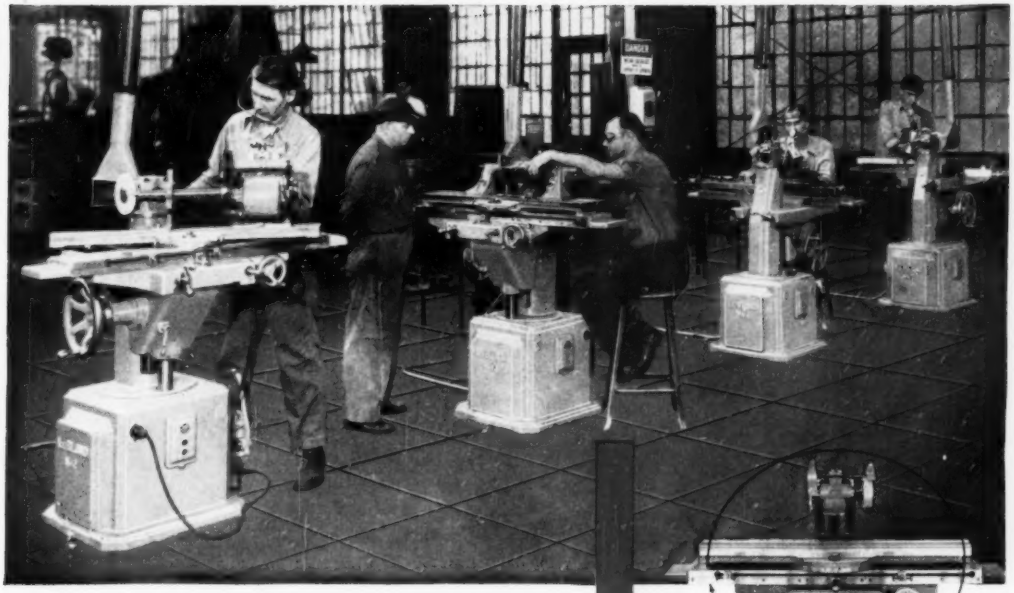
SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT	Page
Positions Vacant	239
Selling Opportunities Offered	239
Employment Services	239
SPECIAL SERVICES	
Contract Work	239
Dayton Rogers Mfg. Co.	239
Elkin Foundry	239
General Pattern Works	239
Kamis Engineering Co.	239
Slocomb Corp., F. F.	239
NOTICES	
Auction	240
EQUIPMENT	
(Used or Surplus New) For Sale	240-251
WANTED	
Equipment	239

ADVERTISERS INDEX

	Page
Aaron Machinery Co.	247
Bennett Machinery Co.	248
Botwinik Bros. Inc.	246
Botwinik Bros. of Mass., Inc.	248
Brooks Inc., B. D.	240
Brownell, Hazard	240
Capitol Machinery Co.	250
Carlson Machinery Co.	250
Chowning Regulator Corp.	240
Continental Salvage & Machy. Corp.	246
Cox Machinery Co.	248
Crobalt Inc.	240
Dakota Steel Products Co.	250
Dictaphone Corp.	240
Dony Machinery Co.	244
Eastern Machinery Corp.	243
Emerman Machinery Corp.	244
Falk Machinery Co.	241
General Employment Service	239
Harrison Machinery Exchange, Inc.	244, 248, 250, 251
Hesse Machine & Mfg. Co., Inc.	240
Hill-Clarke Machinery Co.	249
Howarth Machinery Co.	248
Hyman & Son, Joseph	240
Indianapolis Machy. & Supply Co., Inc.	242
Industrial Plants Corp.	240
Lang Machinery Co.	250
McDonald Machinery Co.	251
Miles Machinery Co.	246
Morey Machinery Co.	245
National Machinery Exchange	246
Osborne & Sexton Machinery Co.	251
Paul's Machinery Co.	251
Perfection Steel Body Co., The	250
Schultz & Anderson Co.	240
Sier-Bath Gear & Pump Co.	240
Simmons Machine Tool Co.	251
Victor Machinery Exchange	244
West Penn Machinery Co.	251
Wigglesworth Machinery Co.	250
Winston Machinery Co., Inc.	244, 250
Wooldridge Brokerage Co.	250



get more flexibility in your tool room grinding with the LeBlond No. 2 Cutter Grinder

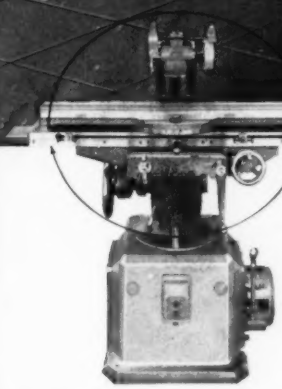
The flexibility for which the LeBlond No. 2 is noted is best illustrated by the photo above. You can operate it sitting or standing, from in front or in rear. Swing it around as you wish to get the precise angle required.

And you can count on the LeBlond No. 2 to deliver the correct speed for each job, because it is the only cutter grinder that gives you four speeds—6500, 5100, 4000, and 3100 rpm—easily and quickly.

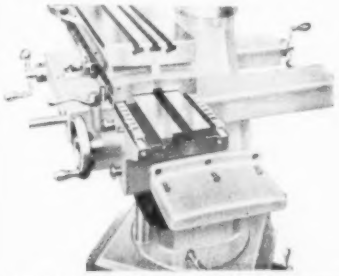
The LeBlond No. 2 offers so many ways of improving the quality and reducing the cost of tool room grinding, you won't be satisfied with anything less. Ask LeBlond distributor nearest you for descriptive bulletin today.

send for

your copy of the No. 2 Cutter Grinder bulletin. The valuable Manual of Tool Room Grinding is also available free of charge.



STATIONARY WHEEL HEAD and revolving table is the only design that can give you 4 speeds . . . all controlled by a single convenient lever.



ROLLER BEARING MOUNTING of sliding table assures long-life accuracy. Note the three slots on swivel table—two angular, one straight—another LeBlond exclusive.

THE R. K. LeBLOND MACHINE TOOL CO. Cincinnati 8, Ohio
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

New York 6, N. Y., Singer Bldg., 149 Broadway, COurtland 7-6621
Chicago 6, Ill., 20 N. Wacker Drive, STAte 5561
Philadelphia 40, Pa., Beury Bldg., 3701 N. Broad, SAgamore 2-5900
Detroit 2, Michigan, New Center Building, TRinity 3-5561

LeBLOND

Do you need immediate delivery from warehouse stock?

52100 TUBING

HIGH CARBON CHROME STEEL — A DIRECT QUENCHING STEEL WHICH GIVES THROUGH-HARDNESS IN MODERATE SECTIONS.

Typical uses:

aircraft parts
slitter knives
bearing races
collets
bushings
spindles
grinding machines
precision instruments
bump parts and plungers

"NICKEL-MOLY" TUBING

LOW CARBON NICKEL-MOLY STEEL— A CARBURIZING STEEL WHICH GIVES HIGH SURFACE HARDNESS WITH A TOUGH CORE.

Typical uses:

piston pins
bearing races
farm equipment
knitting machinery
sleeves
bushings
pump parts
perforating guns

These two TIMKEN® wear-resistant tubes will do 90% of your hollow parts jobs!

You can get the steel tubes you need for 90% of your hollow parts jobs right now. Timken 52100 and Timken "Nickel-moly"—two general purpose steels with good hardenability and wear resistance—are available for immediate delivery in small quantities within 24 hours after receipt of your order! Between them, they have the properties nine out of ten hollow parts jobs require.

Timken 52100 can often be used in place of more expensive steels. It can be heat treated to file hardness and tempered back to any desired point. In moderate sections it is through-hardening. There are 101 sizes of 52100 tubing, from 1″ to 10½″ O.D.

Timken "Nickel-moly" has exceptional stamina and shock absorbing qualities. It is a low carbon, carburizing steel that develops high case hardness and a tough inner core. "Nickel-moly" comes in 48 sizes—1.389″ to 7.915″ O.D.

Used in place of bar stock, these two steels save both material and machining time. And they give you uniformity from tube to tube and order to order. For stock lists, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.